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Rock Products

and CEMENT and ENGINEERING NEWS (Est. 1896)

THE OLDEST PUBLICATION IN ITS FIELD AND THE RECOGNIZED AUTHORITY

Clinker Grinding

SPOKANE PORTLAND CEMENT CO.

GENERAL OFFICES
OLD NATIONAL BANK BUILDING
SPOKANE, WN.

MILL
IRVIN, WASHINGTON

The Babcock & Wilcox Company
85 Liberty Street
New York, N. Y.

Gentlemen:

After several months of operation of the No. 360 B&W Pulverizer in closed circuit with a 16 ft. separator, I am pleased to express my gratification.

During this period the B&W Unit has been called on to grind various kinds of regular and special clinkers, including Modified B Cement, all of which have been pulverized to better than specifications.

Your predictions of capacity and power consumption have been more than met, and you have also demonstrated a gratifying fineness control and low temperatures of finished product.

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Yours truly,
SPOKANE PORTLAND CEMENT COMPANY
R. K. Neill
President

BABCOCK & WILCOX

3/4 yd. LORAIN · 40
Moves 1469 yds. in 10 hrs.
LORAIN-40
THEW CENTER DRIVE
The RECORD and the MACHINE
Units: ¾ yd. L-40, owned by J. B. Fowler, Lexington, Ky.
Job: 20,000 yds. of gravel pit borrow.
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Degrees of Swing: 90° to 180°.
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Average Yardage per Day: 870 yds.
Maximum Yardage per Day: 1469 yds.
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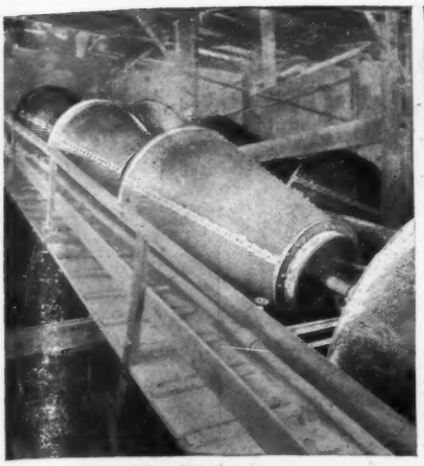

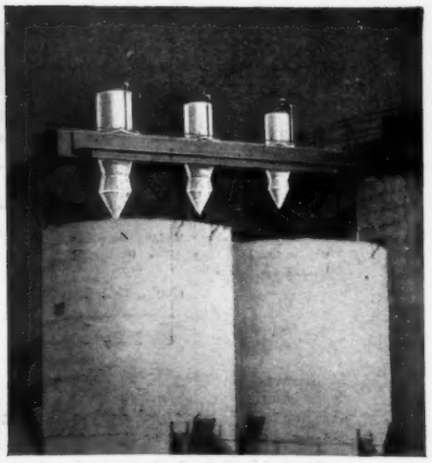

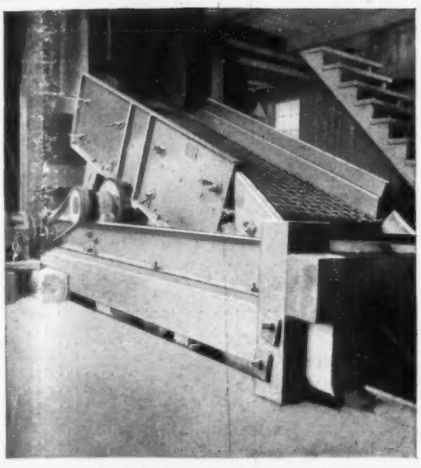

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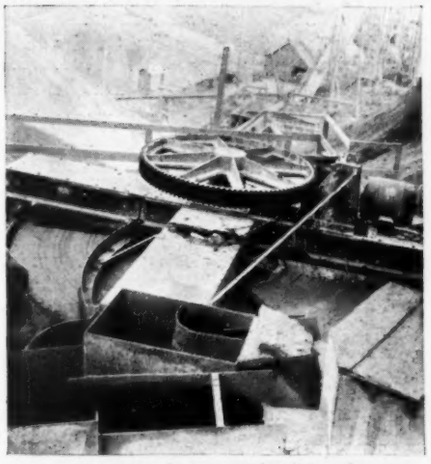

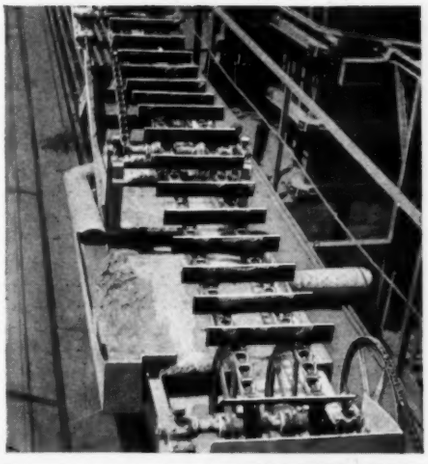

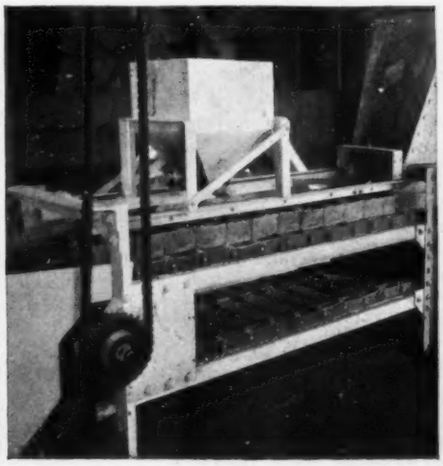

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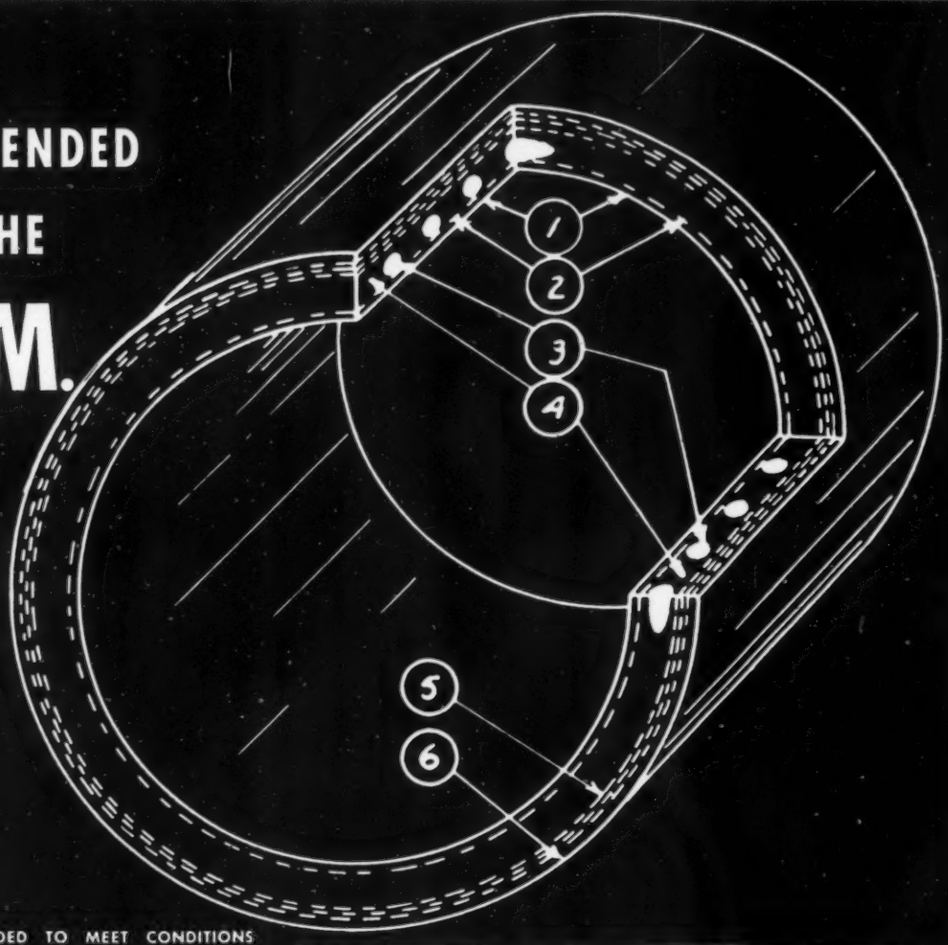

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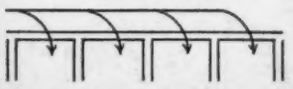

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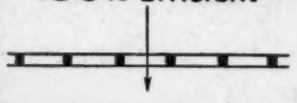

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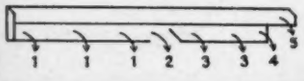

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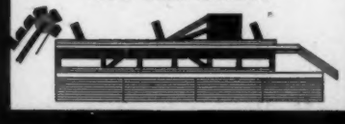

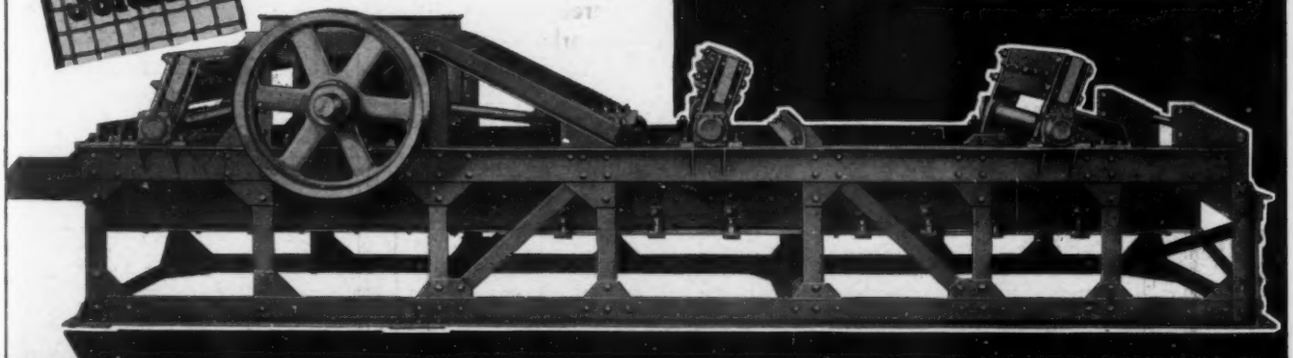

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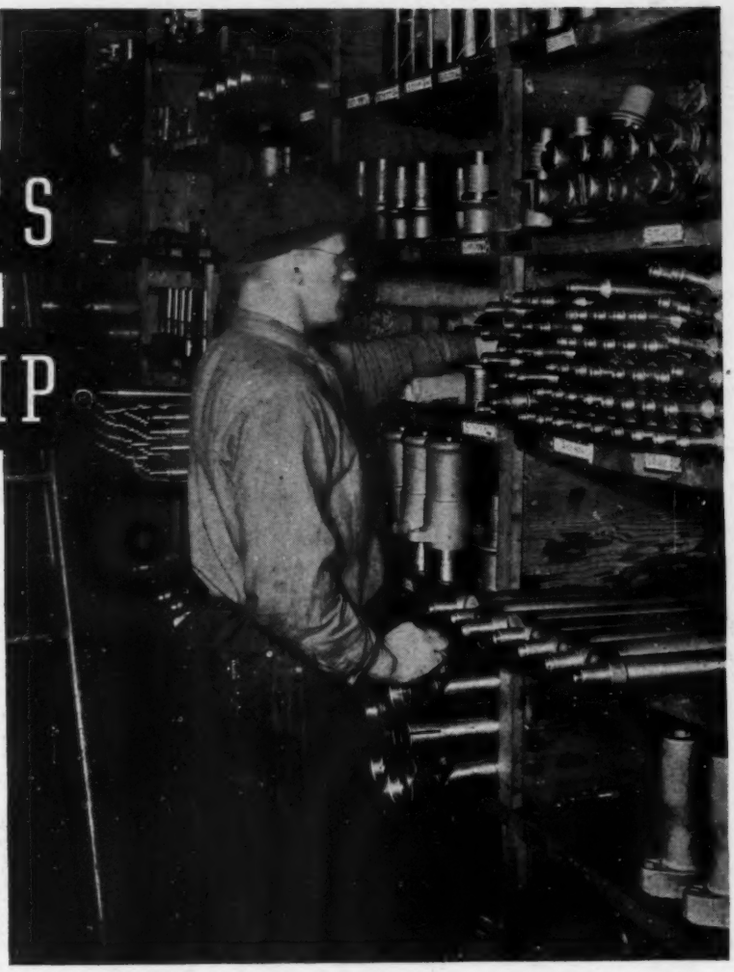

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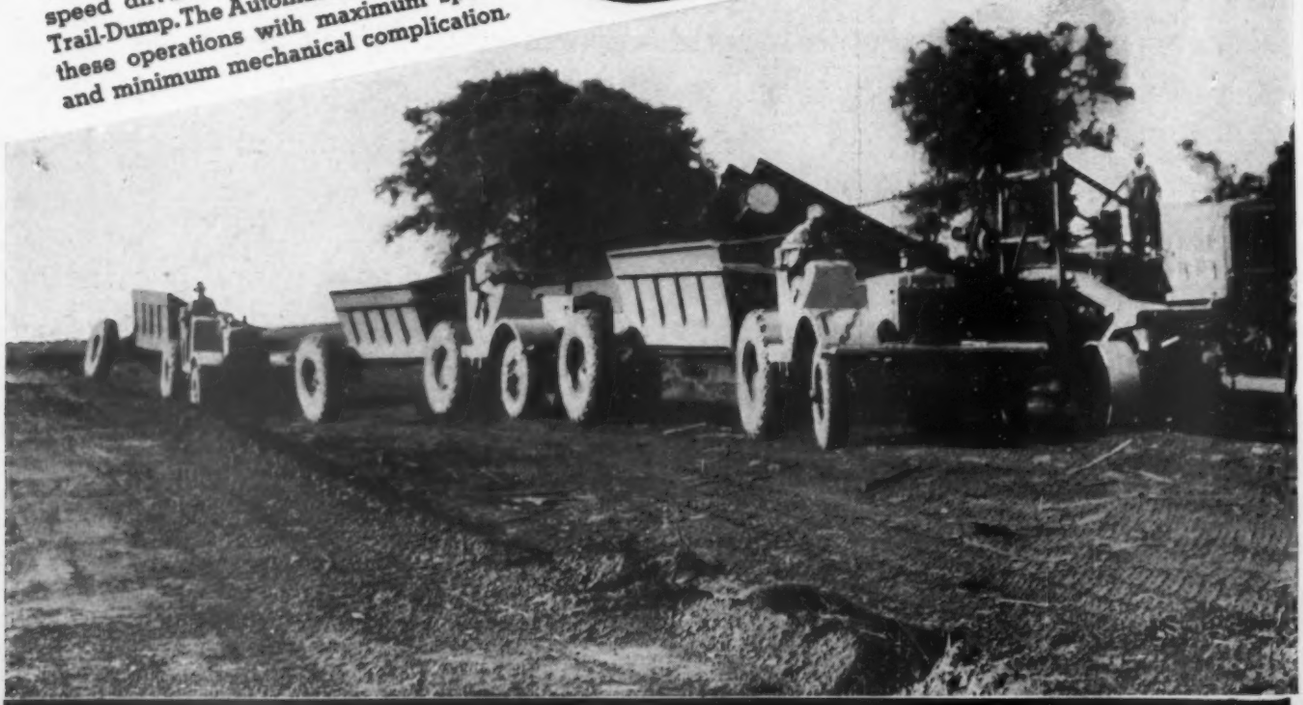

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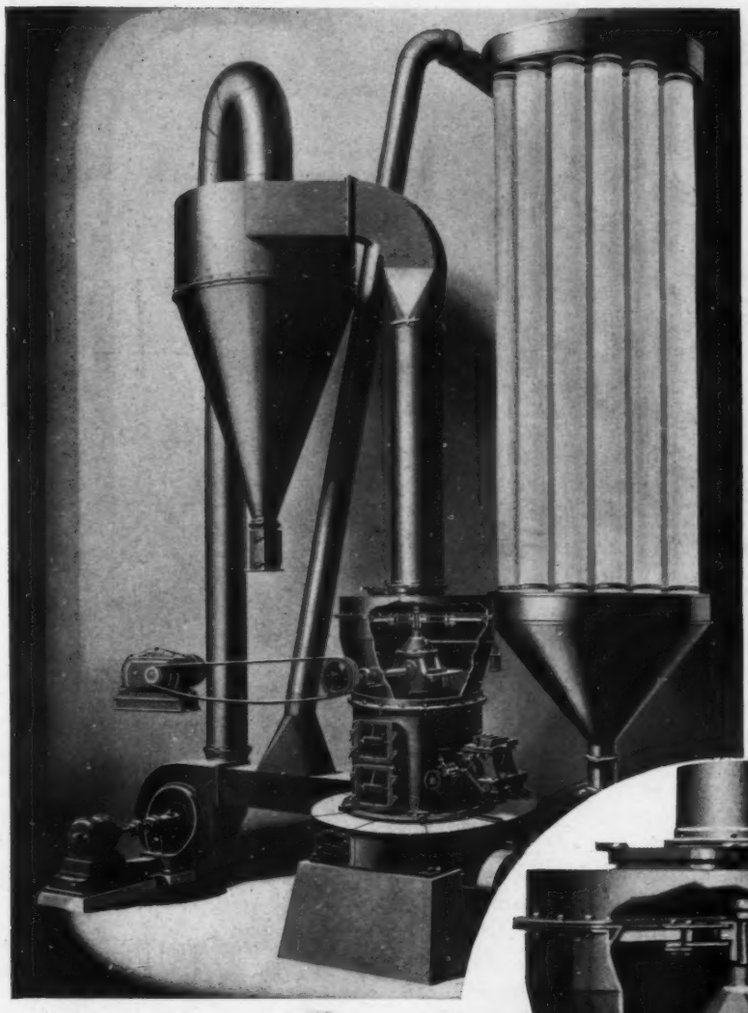

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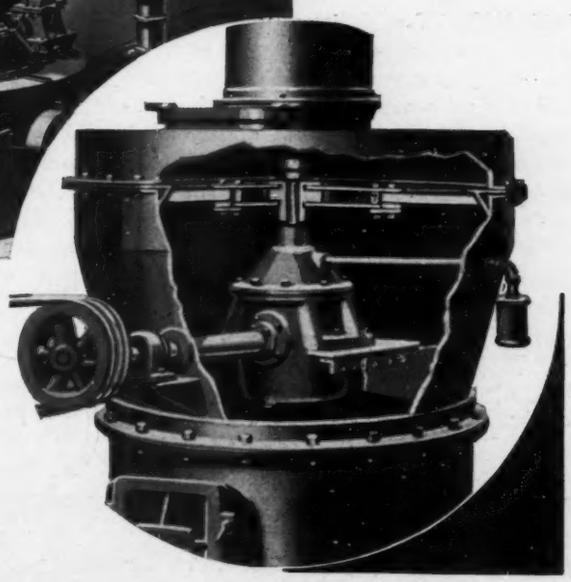

Close-up view of revolving whizzer in the separating chamber

RAYMOND BROS. IMPACT PULVERIZER CO.

Main Office and Works: 1307 North Branch St., Chicago. Division of Combustion Engineering Co., Inc.

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HUGS LAST LONGER

because HUG BUILDS TRUCKS SPECIFICALLY FOR YOUR JOB

● *One of a fleet of 3 Model 87Q Hugs with special 6-yard Phoenix type side dumping quarry body receiving its load from the shovel. These trucks were purchased by the East St. Louis Stone Company, East St. Louis, Illinois.*

● *Lower photograph shows load being dumped by external dumping device.*

IN QUARRY and stone product operations the severe abuse and shocking power of solid rock when loaded, plus steep grades with abrupt holes and jagged bumps, calls for an exceptional truck with real guts to take the terrific beating of constant quarry service. Hug quarry models have proven their superiority over ordinary trucks in quarry operations time and time again because Hugs have that *extra stamina built into every part*. From axles to body canopy, from tail gate to bumper, these massive transportation units are designed to meet the most severe conditions encountered in quarrying and stone operations and show a profit even after years and years of service.

Hug offers a complete line of quarry models ranging from 5 to 12 cubic yards capacity, available with various types of quarry bodies to meet your specific hauling operation.

Tell us about your transportation needs. Let our engineers study your individual requirements and recommend specially designed and built Hug equipment.

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THE HUG COMPANY
590 Cypress Street • Highland, Illinois

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Announcing THE NEW Owen Grapple

revolutionary in PRINCIPLE and PERFORMANCE

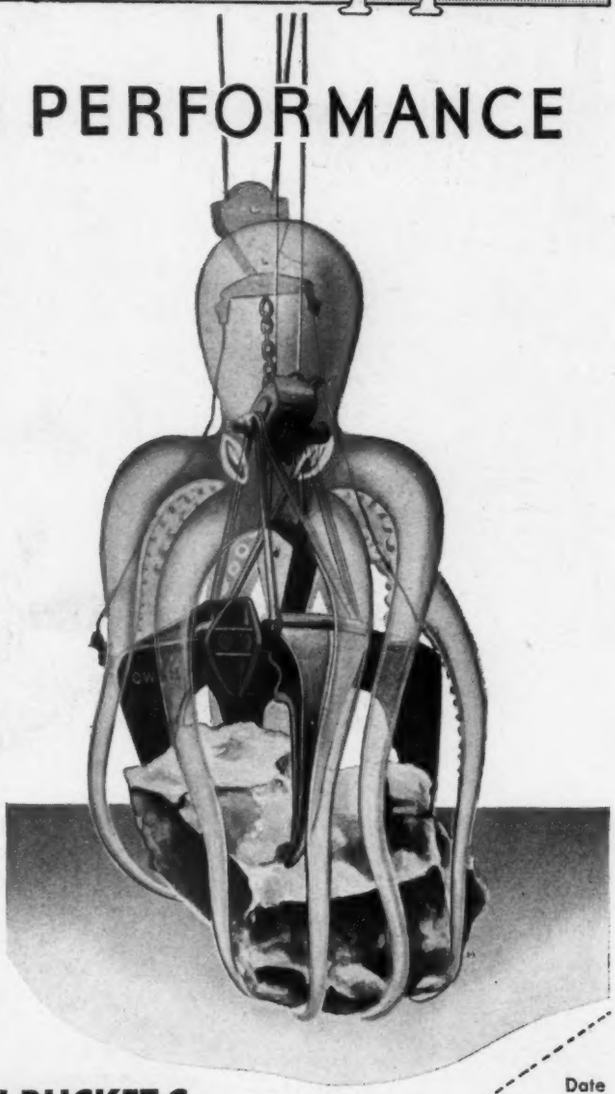
THIS NEW OWEN GRAPPLE has 4 independently operating tines each of which firmly grasps the rock, regardless of its shape.

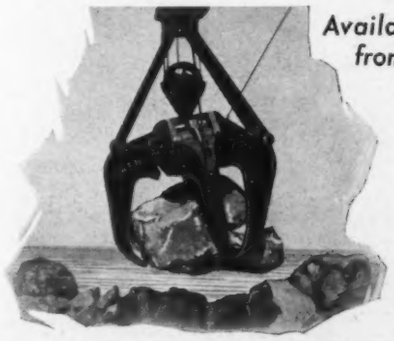
Like an octopus, it *cunningly entwines its victim —exerts super-human strength* and *clings with inescapable tenacity.*

Numbers of these grapples have already proved their exceptional ability in *easier handling, increased capacity* and *greater safety of operation.*

Read our new illustrated, descriptive bulletin and you will clearly understand why this new grapple measures up to Owen standards which demand "a bigger days work."

Mail the coupon for grapple literature or folder describing the advanced line of Owen Buckets which now assure an even larger "MOUTHFUL AT EVERY BITE."





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Address _____ City _____

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and an even larger MOUTHFUL AT EVERY BITE *in* Owen Buckets

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the P&H WARD LEONARD SHOVEL FASTER

IN step with the changes which are taking place in all lines of industry, Harnischfeger presents the new P&H Ward Leonard shovel with complete one-man control. It brings wholly new ability into the field for open pit mining.

New high tensile steels, stronger and far lighter, have thrown off the burden of dead weight, reduced inertia. New mechanical improvements have made it smoother-running, easier to operate. Greater power has given it greater speed to produce more by producing faster.

HARNISCHFEGER CORPORATION

4465 West National Avenue *Established 1884* Milwaukee, Wis.

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In thousands of plants Socony-Vacuum is helping managements and shop forces to improve the quantity and quality of production

THE NEXT PAGE WILL HELP YOUR MEN

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GARGOYLE LUBRICANTS "perk up" equipment . . . give it new life . . . make it work better, faster, cheaper. That's being proved right now on some of the biggest construction jobs in America.

Thousands of contractors find it profitable to make daily use of our lubrication experience. See the Socony-Vacuum representative. He can help your men boost the earning power of your units.

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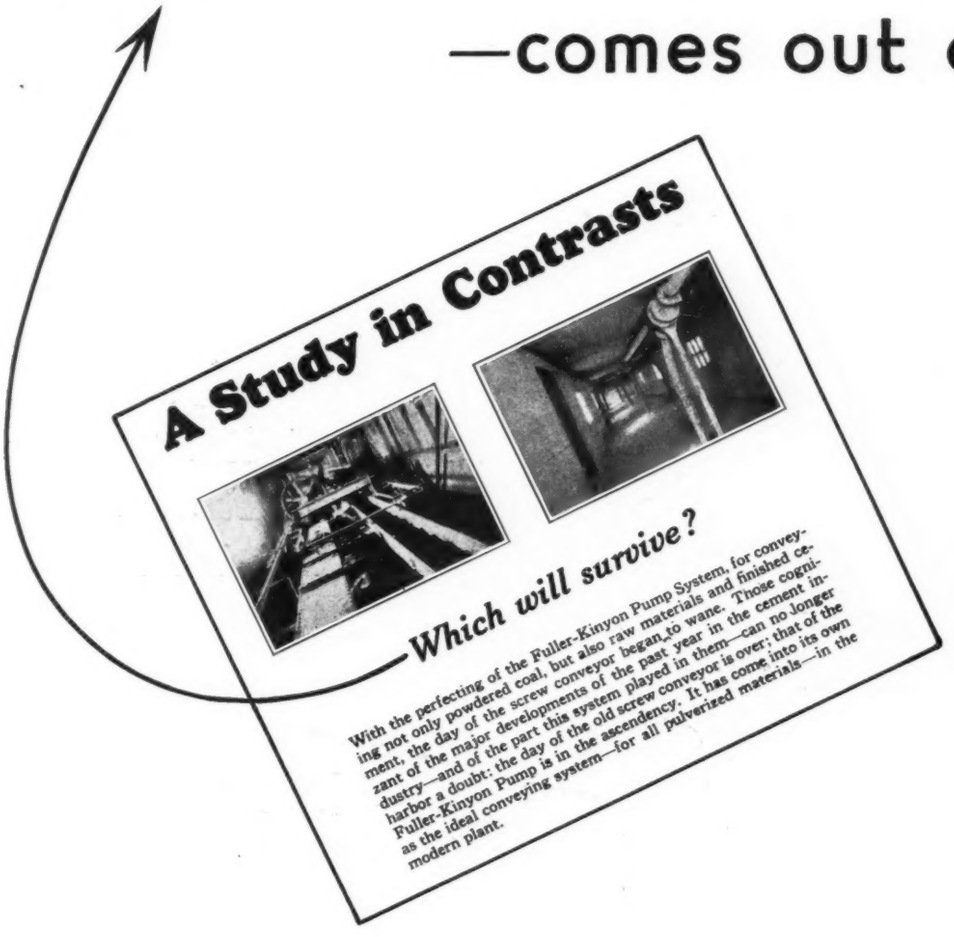
GARGOYLE
Lubricants

FULLER-KINYON

—comes out on top


A Study in Contrasts
Which will survive?
With the perfecting of the Fuller-Kinyon Pump System, for conveying not only powdered coal, but also raw materials and finished cement, the day of the screw conveyor began to wane. Those cognizant of the major developments of the past year in the cement industry—and of the part this system played in them—can no longer harbor a doubt: the day of the old screw conveyor is over; that of the Fuller-Kinyon Pump is in the ascendency. It has come into its own as the ideal conveying system—for all pulverized materials—in the modern plant.

THE above is a copy of an advertisement which appeared eleven years ago. In those days there were many who were quite skeptical as to the safety and utility of such a machine. But, as the years progressed, these skeptics along with the old fashioned and outmoded methods of conveying fell by the wayside, until today, the Fuller-Kinyon System of conveying through pipe lines is the leader in its field for transporting dry pulverized materials.

This system has been adopted universally by the cement industry, and is used extensively in many other process industries for unloading, conveying, and elevating. During these years the Company has also developed and built the Fuller-Kinyon Unloader, adopted by contractors generally for unloading bulk cement from box cars.

The many advantages of the Fuller-Kinyon System have long since been conclusively proved. Minimum repair costs...only one moving part, the screw in the pump. Flexibility of application...pipe lines can be placed underground or overhead. Installations can be made where conditions would make any other system an impossibility.

Through many years of experience and close contact with the field and its requirements, the Fuller Company is today in a position to make studies of your requirements and furnish equipment that only the best engineering skill and careful workmanship can produce.

FULLER COMPANY
CATASAUQUA, PENNSYLVANIA

Chicago: 1118 Marquette Bldg.
San Francisco: 320-321 Chancery Bldg.

P-11

FULLER-KINYON, FLUXO, AND AIRVEYOR CONVEYING SYSTEMS · · · · ROTARY FEEDERS AND DISCHARGE GATES
ROTARY AIR COMPRESSORS AND VACUUM PUMPS · · · AUTOMATIC BATCH WEIGHERS · · · BIN SIGNALS

A TYPICAL EXPERIENCE

After careful experimentation in a granite quarry . . .

ATLAS APEX

replaced old type dynamite at lower initial costs . . .

RESULT . . .

"A gratifying saving in blasting costs!" . . .

BECAUSE . . .

Apex . . . the modern, scientific quarry explosive . . . proved better suited to the blasting needs of this granite quarry producing crushed granite for concrete, macadam and similar uses. Profit by this typical experience. Let the Atlas representative arrange an Apex demonstration in *your* quarry.

ATLAS POWDER COMPANY, WILMINGTON, DEL.

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ATLAS

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AMERICAN TIGER BRAND

keeps an Eye on Costs

AMERICAN TIGER BRAND WIRE ROPE

NO matter where you are — or what job you ask wire rope to do — you'll find that American Tiger Brand Wire Rope has a reputation for long life and dependability.

Our engineers have studied every angle of the problems you're up against and they have designed a type and size of rope for every need. Just remember that you can save money with American Tiger Brand Wire Rope.

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Russ Building, San Francisco
United States Steel Products Company, New York,
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UNITED STATES STEEL

Modern science of blending soils opens new field to AGGREGATE PRODUCERS

MANY a gravel pit, quarry and brickyard is going to pour out ready-mixed, ready-to-apply stabilized road surfacing. Nineteen thirty-six is the year for building secondary roads, and stabilized mix is the material most needed.

Soil scientists have discovered, and highway engineers have applied to road building, the properties of cohesion, friction, endurance, and firmness. Certain soils possess and retain their desirable properties when mixed with moisture regulating Calcium Chloride and provide a stabilized road at very low cost.

Fortunately, most of the needed soils are available in or near regular pits and quarries. Much of the bulk consists of overburden soils and finer aggregates, often unsalable in commercial work except as "fill" dirt. Much of the equipment necessary for testing, grading, proportioning and mixing is already in the pits and quarries.

So it costs aggregate producers very little to get into this profitable business of supplying "stabilized soil mix." Bulletin number 24 tells how. Write for it today.

Above—A typical Michigan stabilized road.

Left—Pit operations using clay overburden, at New Hudson, Michigan.

Below—Sandwich Fairgrounds stabilized road, De Kalb County, Ill.

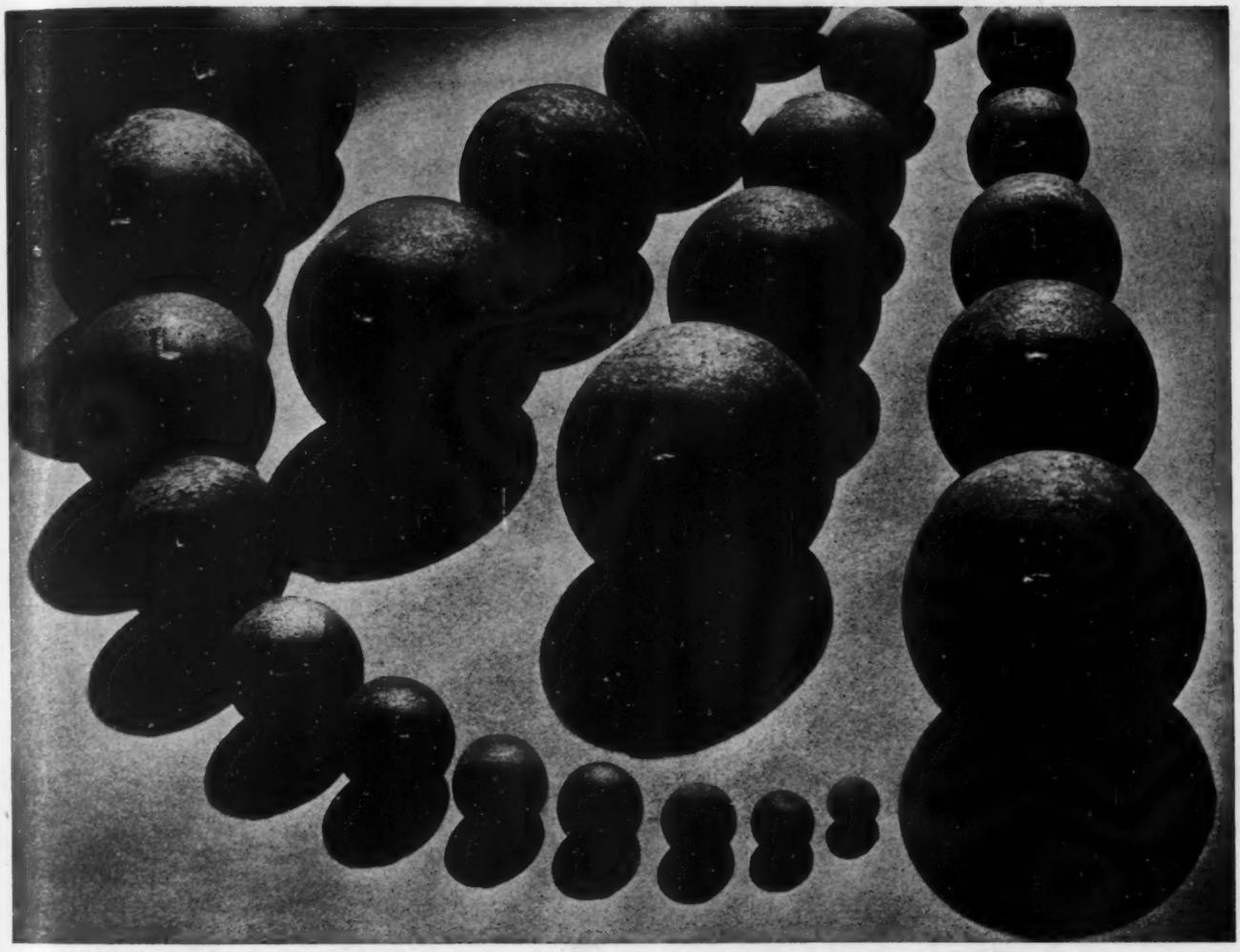
Calcium Chloride Association

Michigan Alkali Company, 60 E. 42nd St., New York City
Solvay Sales Corporation, 40 Rector St., New York City
The Columbia Alkali Corporation — Barberton, Ohio
The Dow Chemical Company — Midland, Michigan

CALCIUM CHLORIDE

FOR STABILIZING ROAD SURFACES

OUR *Control* HELPS MAKE YOUR PRODUCT UNIFORM



WE know our ore just as you know your raw materials. With this ore, our control starts. Control follows through every step of the steelmaking to give you correct structural characteristics and proper physical properties. Control in finishing and heat treating carries on through to the final stages. Because you get the uniformity based on this control, your own product will also be more uniform.

Order Lorain Balls for cement or other grinding in these diameters — ½", ⅝", ¾", ⅞", 1", 1¼", 1½", 2", 2½", 3", 3½", 4", 4½", and 5".

OTHER LORAIN PRODUCTS

Mill Liners and Screens of Manganese, Chrome Nickel and plain Carbon Steel or Hard Iron; Hammers for Swing Hammer Mills; Industrial Cars and Trackwork.

CARNEGIE-ILLINOIS STEEL CORPORATION

Lorain Division — Columbia Steel Company, San Francisco, *Pacific Coast Distributor*

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UNITED STATES STEEL

Weld manganese and carbon steel castings and forgings with . . .

TIMANG

(AIR-TOUGHENING)

MANGANESE

WELDING ROD

From every angle you'll get greater efficiency from TIMANG. It's easier for any welder to use because it flows freely and welds quicker . . . without affecting the metal close to the weld. And the finished weld will be as tough and strong . . . with the same resistance to wear . . . as the parent metal.

TIMANG is the original manganese steel welding rod . . . developed in TISCO laboratories . . . and now used extensively for repairing and building up manganese steel wearing parts and carbon steel forgings and castings.

TIMANG is sold direct and through sales organizations. Your jobber or distributor handles this rod . . . in some cases under a private trade name. Be sure you insist on the Taylor-Wharton product. Bulletins on request.

TISCO products include manganese steel pump parts, cutter heads, dippers, buckets, dipper teeth, racks and pinions, jaw plates, cheek plates, hammers, liners, mantles, screen cloth, perforated plate, grinding balls, etc.

WRITE FOR BULLETINS

TW

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HIGH BRIDGE, NEW JERSEY

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The pacemaker in
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THE most exacting basis for judging wire rope performance is AVERAGE SERVICE.
This is the basis advocated by Roebling, in which rope cost per ton of material handled, or per other unit of service measurement, is based not on the service of a single rope but on the average service of several ropes.
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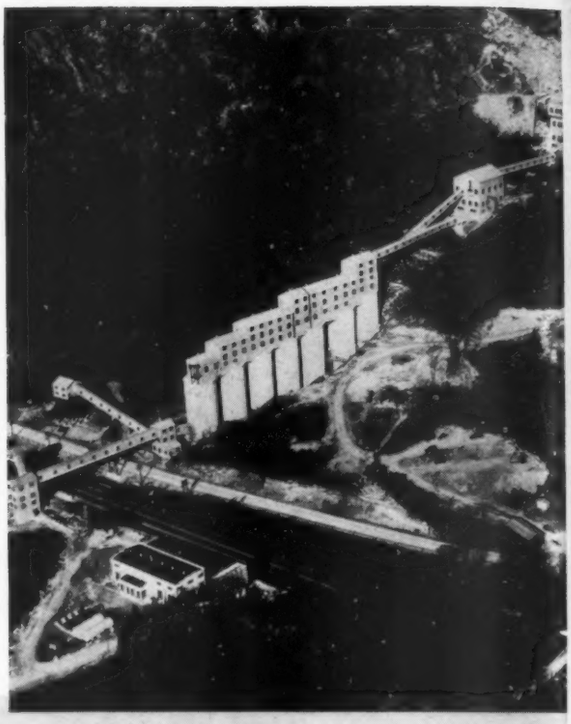
HOW TO HANDLE IT

IF IT IS SAND GRAVEL OR STONE



FOR THE HEAVIEST JOBS OF THE SECOND LARGEST BULK HANDLING INDUSTRY USE REX

● Sand, gravel, and stone are exceeded only by soft coal in annual tonnage produced. In bulk handling equipment, this industry is probably the biggest user.

The Chain Belt Company is a large supplier of super-capacity elevators to this industry. Combined, those now in use represent a super-capacity elevator with an hourly capacity of 11,900 tons.

The belt conveyors supplied by this company and conveyors equipped with Rex-Stearns Idlers are measured in miles and their annual capacity in the millions of tons.

Even 1800 Rex spray nozzles are washing the faces of the industry's products.

The book, "How to Handle IT," naturally shows a number of installations in this important industry. Send for your copy, also ask for the new idler folder entitled "Fortune."

The cover of this idler folder is a reproduction of the front cover of Fortune magazine for August, 1934, featuring largest hard-rock plant in the world, completely equipped with Rex-Stearns Idlers.

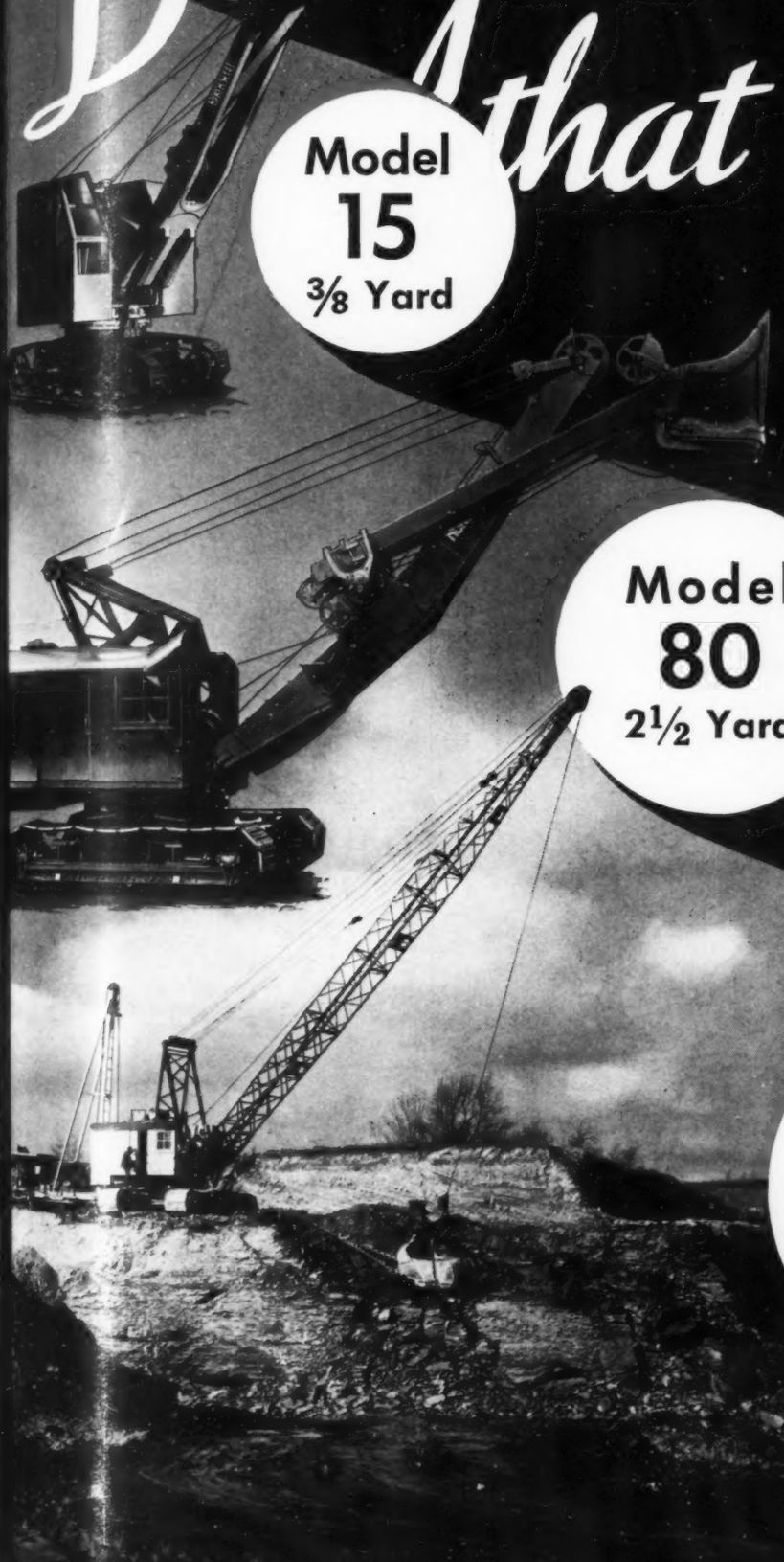
CHAIN BELT COMPANY
1649 W. Bruce St., Milwaukee, Wis.

REX

CHAIN BELT COMPANY
OF MILWAUKEE

Chain and Belt Conveying

Do you know that



Model 15
3/8 Yard

Model 80
2½ Yard

NORTHWEST CRAWLER EQUIPMENT

is built in a range of 15 Sizes

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Shovels
3/8 to 2½ Yd. Capacity

Draglines
3/8 to 3 Yd. Capacity

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One of the larger NORTHWEST DRAGLINES on a typical stripping operation

NORTHWEST

NORTHWEST ENGINEERING COMPANY
1702 Steger Building, 28 E. Jackson Blvd., Chicago, Illinois

Gentlemen: We are interested in a machine of ..... Yd.
Capacity for .....

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● Purple Strand—in itself—is an unusual rope where extreme strength is required

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● Where *Pre*formed suits your requirements better, "Form-Set" Purple Strand — Williamsport's method of *pre*forming—will give you remarkable service.

Let us send you our new Catalog and manual just off the press. Tell us what your requirements are and the service you require, our engineers will gladly aid you.

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Rock Products
With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896

Volume XXXIX Chicago, June, 1936 No. 6

TREND Toward Decentralization Becomes EVIDENT

THIS issue of ROCK PRODUCTS contains an exceedingly interesting and significant news item in regard to the project of a well-known Middle West cement company to dismantle unused manufacturing facilities and set them up in a new location in its present sales territory. What the reaction in the cement industry may be to this project is unknown at this writing; for while it is true that the sales territory served by the projected plant is already partially served by the same company from its other plants, the new plant would of course give it an additional sales advantage in that territory. Nevertheless, this is a far better solution of the cement industry's problem of over-capacity than leaving the territory open to a new and untried producer, who would add a million or more barrels a year capacity to an already over-expanded industry.

Every one familiar with the cement industry knows that much of the 260-odd million barrels of plant capacity now available never will be used again 100 per cent, because it is concentrated in localities where it was established to fill concentrated construction demands for concrete highways, for example, which are now built. It is true, of course, that in the years to come these highways will have to be widened, rebuilt, improved with grade-crossing eliminations, etc. But such construction demands will be spread out over a longer time and great sudden demands on the cement industry, as in the past, are not likely to be made.

Also, as we all know, there have been many technical and operating changes in the cement industry which have tended to obviate the need of excessive manufacturing facilities, such as the tremendous increase in storage and shipping facilities that practically all the producers have participated in during the last ten years. Again, technical and mechanical improvements have certainly rendered some of the alleged capacity of the industry obsolete.

It is a nice problem for all the present manufacturers to decide whether to rehabilitate these obsolete plants in their present locations, or wipe them out entirely and build new productive facilities on a smaller and more modern scale elsewhere. As the cement company officials in the case noted have decided, probably many plants are now obsolete because of uneconomic locations for future business, as well as mechanically obsolete. We did not know when we wrote the editorial in the May issue of ROCK PRODUCTS on basing point prices along these lines that there would be so soon an outstanding example of a cement manufacturer who was ready to act on this trend of industry towards decentralization of manufacturing facilities. We think the significance of this move will be more appreciated as time goes on.

Henry Ford, who probably has one of the largest investments of capital in concentrated manufacturing facilities in the world, has long been an advocate of decentralization of such facilities. More recently the General Motors Corporation has also taken the same point of view. And, wisely or otherwise, the New Dealers have made it one of their objectives. About the only reason for the concentration of some industries in one locality was the availability of skilled labor in that locality. But skilled labor plays less and less of a role today in many of these industries, for not only has output per man-hour increased, but perfection of machines and processing have done away with the rule-of-thumb skilled workman. This is particularly true of the rock products industry.

While statistics published elsewhere in this issue, compiled by the U. S. Bureau of Labor Statistics, apparently show that cement is manufactured at less cost in large plants than in small ones, there are other compensating advantages, even if this is true, which seems open to question. It is easier to take care of a small group of employes during shut-down periods, that seem inevitable, than it is to care for a large group, especially if the plants are located in rural areas where the workmen may have gardens or small farms. Also there is less chance of labor troubles. Moreover, according to the government statistics, it is more economical to operate small plants at part capacity than large ones.

This should be particularly true where several small plants are operated by the same producer, for then the overhead costs would be distributed, and these fall heavily on the single small plant.

What holds for the cement industry is even more true for the aggregates industry and the lime industry, for raw materials are widely distributed, and while some may need more processing than others, good and marketable products can be made from a great variety of raw materials. Even in the lime industry, where it is generally assumed that deposits of pure limestone are comparatively rare, it is within the range of possibilities that processes may be used to concentrate, or purify, limestones at present considered unsuitable for some kinds of lime. Such a process is already being used to concentrate an impure limestone for portland cement manufacture. With a rotary kiln burning a limestone slurry, this same process might be used to make a high calcium lime from an originally impure raw material.

We do not want to appear as agitating such developments, but we should be remiss in our duty to the industry if we foresaw such developments and did not forewarn the industry of their possibility, or even probability. We firmly believe that the next few years will see the construction of many new small, modern plants to serve sales territories already served by existing plants. Whether these new plants are built by present producers or by newcomers depends on the attitude of producers toward this problem. Even the powerful United States Steel Corporation has steadily lost business to new and more modern small steel plants built closer to steel consumers—not so much to new producers at old producing points. It may be possible to regain some of this business, at least temporarily, by big new economies in big plants, but sooner or later American ingenuity will find ways to apply some of these economies to the smaller plants, and the cycle will start all over again.

Localizing Productive *Capacity*

Marquette Cement Manufacturing Co., Chicago, Ill., announced in Vicksburg, Miss., May 28, that it had acquired options on limestone property north of Vicksburg along the Yazoo River and Highway No. 3. Work is to be begun at once on prospecting the area and, if drillings and tests prove the rock suitable for portland cement manufacture, the property will be acquired. Subsequently a portland cement manufacturing plant will be built.

Not an Expansion

In commenting on the acquisition of these options, officials of the company, who were in Vicksburg, stated that this move would not be an expansion of their present producing facilities but merely a transfer of a part of their productive capacity from one point to another. Marquette now has producing plants in northern Illinois and in southeast Missouri. "In those areas," said Mr. W. A. Wecker, president of the company, "we believe that producing capacity is so concentrated as to prevent its fullest use, no matter what condition of prosperity may be enjoyed by those regions in the future. Because of this, we are endeavoring to rearrange the locations of our total producing capacity so as to bring about a better relationship between the consuming potentialities of the various markets and the total cement production available to them."

Commenting further on the relationship of productive capacity to consumption, Mr. Wecker had the following to say: "Should we transfer part of our present producing facilities to Vicksburg, we would not be invading new markets. Marquette has served the areas around Vicksburg, down to and including New Orleans, for many years out of its packing plant at Memphis, Tenn. However, we would be recognizing a trend in consumption which seems to indicate increases in the use of concrete in the southern part of the great Mississippi Valley with a consequent desire on our part of becoming more closely identified with it locally."

"Nevertheless," Mr. Wecker continued, "there would be no economic justification for increasing the capacity for cement manufacture in the South, no matter how rosy the prospects might be. A glance at the statistics will prove that. Total producing capacity of portland cement plants in the United States stands at 250 million barrels per year. Last year the industry shipped 74 million barrels, a little less than 30% of what it could have done. This year there will be a little improvement. Present estimates indicate a consumption of about 85 million barrels, just 34% of capacity."

"Now let us look at the local picture," Mr. Wecker continued. "The market for a plant at Vicksburg would be Mississippi, Louisiana, and Arkansas. Productive capacity serving this area now is situated in Birmingham, New Orleans, Arkansas, Tennessee and Texas. The combined capacity of these plants is approximately 17,500,000 bbl. per year. The consumption in the local tri-state area last year was 2,300,000 bbl. or less than 14% of this producing capacity. This year consumption will be about 2,900,000 bbl., a little better, but still less than 17% of the total that could be shipped.

Program Is Unique

Mr. Wecker stated that this idea of shifting productive capacity is new in the industry—has not been done before in this country, and continued: "Producing capacity in our industry has been built up in the past on sudden large demands in certain areas for materials for new construction projects. These initial demands were far greater than subsequent normal replacements demand could possibly be and, as a consequence, we have today a concentration of capacity in those areas all out of proportion to what may reasonably be expected from normal replacement demand in the future. Consequently, shifts of this excess capacity to areas of new initial demand are imperative and we predict that the industry will witness many such shifts in the next ten years. To us it seems that the only alternative in the case of many existing old plants is deliberate reduction of capacity incident to modernization or rebuilding, so as to bring the total capacity of all more in line with present and future consumption potentialities in their respective markets."

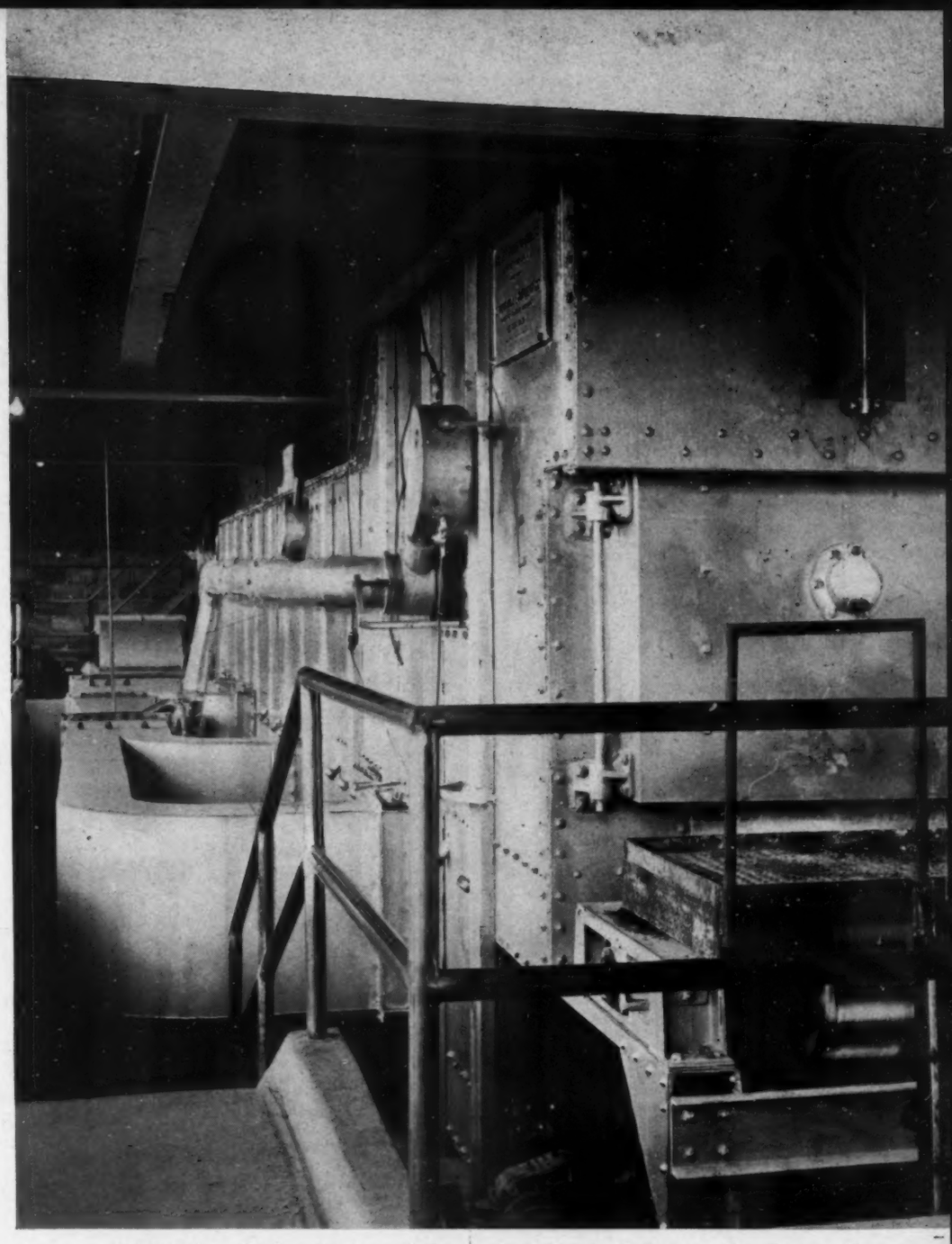
Increase in Industrial Building

INDUSTRIAL BUILDING plans submitted to the New York State Department of Labor in April were the largest in number recorded for that month in the 12 years for which records have been kept. During the month plans were 167% of that month's average and represented a gain of 12% over the preceding month, which was a 12-year record for March.

To Rebuild Plant

Universal Atlas Cement Co., Chicago, Ill., has announced its intention to rebuild its Leeds, Ala., plant at an estimated cost of about $1,500,000. The improvements include a new concrete stock house with capacity of 164,000 bbl. of cement, the construction of which will require the employment of between 300 and 400 extra men; electrically operated quarry shovel with capacity of 5 tons per minute to replace hand loading in the quarry; new stone crusher with double the capacity of the present one; entirely new grinding equipment for both raw materials and final grinding; new unit coal pulverizer for each kiln, eliminating storage of pulverized coal and its consequent danger from fire; new shops, offices and laboratories. Work on the stock house begins in June and is expected to be completed in September. The entire program is scheduled for completion early next spring.

Kiln Output *Upped* 15%



Cooler installation at plant of Cumberland Portland Cement Co., Cowan, Tenn.

New Process Cooler Effects Numerous Economies in Southern Cement Plant

THE CUMBERLAND PORTLAND CEMENT CO., Cowan, Tenn., installed a year ago a Lee process clinker cooler and combustion-air preheater, in connection with which a member of the editorial staff of ROCK PRODUCTS, with the kind co-operation of the company's officers, has obtained some interesting experience data.

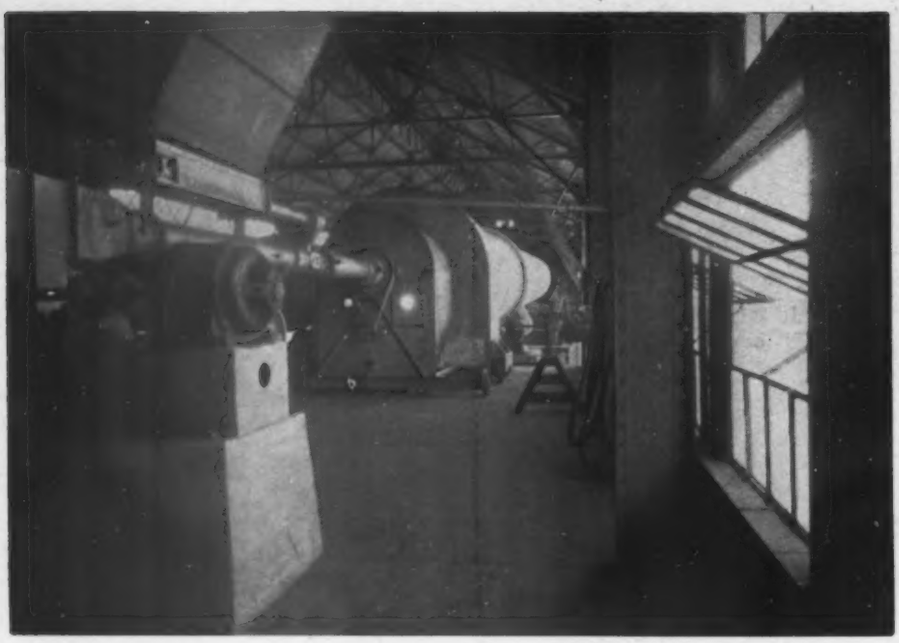
The cooler was designed especially for the 10-ft. by 150-ft. Allis-Chalmers kiln (1000 bbl. capacity) and since its installation it has increased the kiln's output 15%. The only change necessary in the kiln installation was the addition of a bustle or mixing chamber to the front end of the kiln hood, where proper proportions of primary and secondary air are mixed with the pulverized coal before entering the kiln proper.

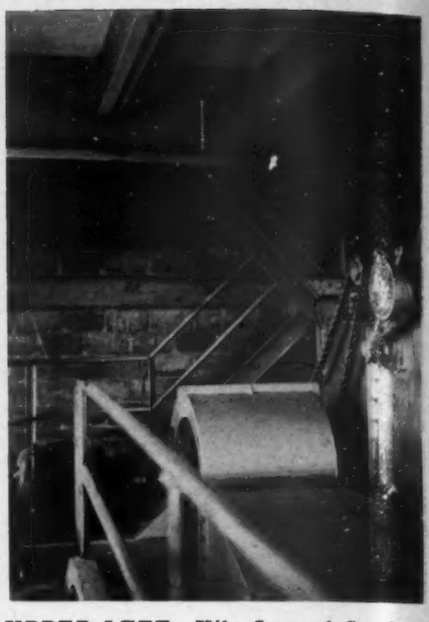
The intake end of the cooler is set vertically below the discharge end of the kiln, so that the hot clinker falls by gravity to the chain grate of the cooler. No air is allowed to pass up this chamber. The cooler is 60 ft. in length from its intake end to its discharge end at the clinker storage, and the grates are 3½ ft. in width.

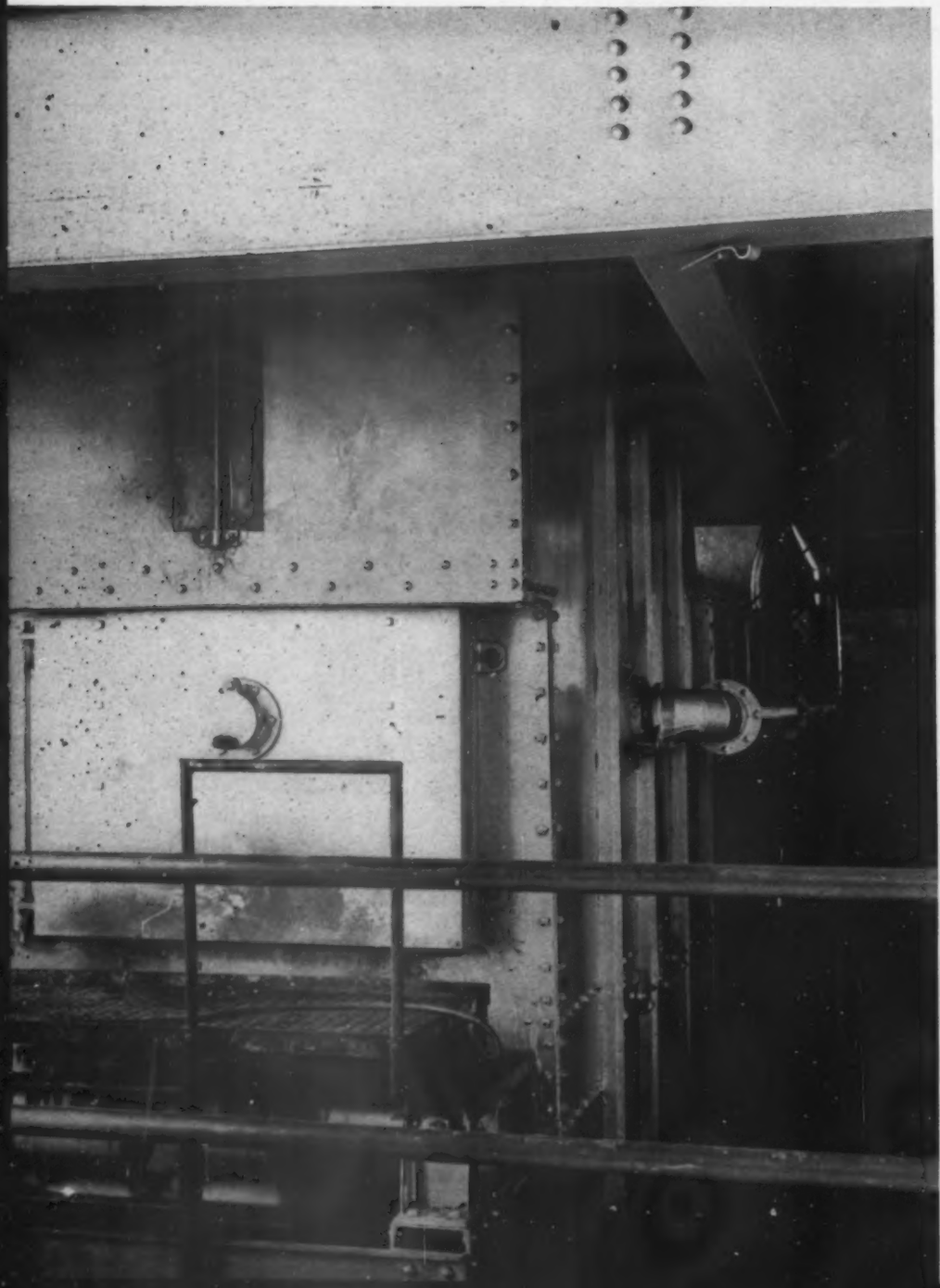
A 3 hp. General Electric motor drives the chain grates through a V-belt connection to a Reeves variable-speed transmission, direct-connected to a No. H.T-12 Palmer-Bee herring-bone gear reducer.

The clinker travels at approximately 18 in. per minute on the chain toward the discharge end, requiring from 30 to 40 minutes to be reduced in temperature from 2200 deg. F. to approximately 40 deg. F. above atmospheric temperatures. The clinker is cool enough at the discharge end so that it can be caught in the hand. A 3-hp. General Electric motor and Palmer-Bee herring-bone gear reducer are used to operate a dust screw to remove dust falling through the grates.

The installation is designed to give as perfect combustion as possible by positive mixing of predetermined quantities of preheated primary and secondary air with the fuel. The intimate mixing of air with fuel results in quicker combustion of the fuel, with a shorter, hotter controllable flame, having a temperature up to 3100 to 3200 deg. F. in place of the 2800 deg. F. temperature before the addition of the cooler.







UPPER LEFT—Kiln floor of Cumberland Portland Cement Co. Note bustle added to front of kiln. ABOVE—Discharge end of cooler, showing secondary air fan in center. LEFT—Intake end of cooler

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Secondary air is blown through the grates from below by a Series 30 Sirocco fan, driven by a 75-hp. General Electric motor. The drive operates through an SSA ball bearing unit manufactured by the Fafnir-Bearing Co. This secondary air inlet is located at the discharge end of the cooler at a point where the coldest air is available.

The cooler has a double wall, the inner one being of refractory brick. It is divided into three chambers. The first one is the clinker receiving chamber; the second the processing chamber where air from 1200 deg. to 1400 deg. F. is taken off, and the temperature of the clinker is reduced from 2200 deg. F. to 800 deg. F.; and a third chamber nearest the discharge end, where the clinker is reduced from 800 deg. F. to approximately atmospheric temperatures.

Gates operating on counter-weights separate the chambers from each other. These gates are pivoted at the top edges, and drag on the clinker as it passes along on the grates below. Air from the second, or processing, chamber passes upward to the bustle at the firing end of the kiln to form a combustible mix with the coal. Air from the third chamber passes at 250 deg. F. as waste air to a stack 4 ft. in diameter and 30 ft. high, where it discharges into the atmosphere. The gates separating the chambers from each other are of sheet steel. The one nearest the heat zone is air-cooled. An 8-in. pipe line carries cool air from the secondary fan to this gate.

The primary fan, also a Sirocco, driven by a 40-hp. General Electric induction motor, is located on the kiln floor above. Air at approximately 300 deg. F. from between the two walls of the cooler, and from the

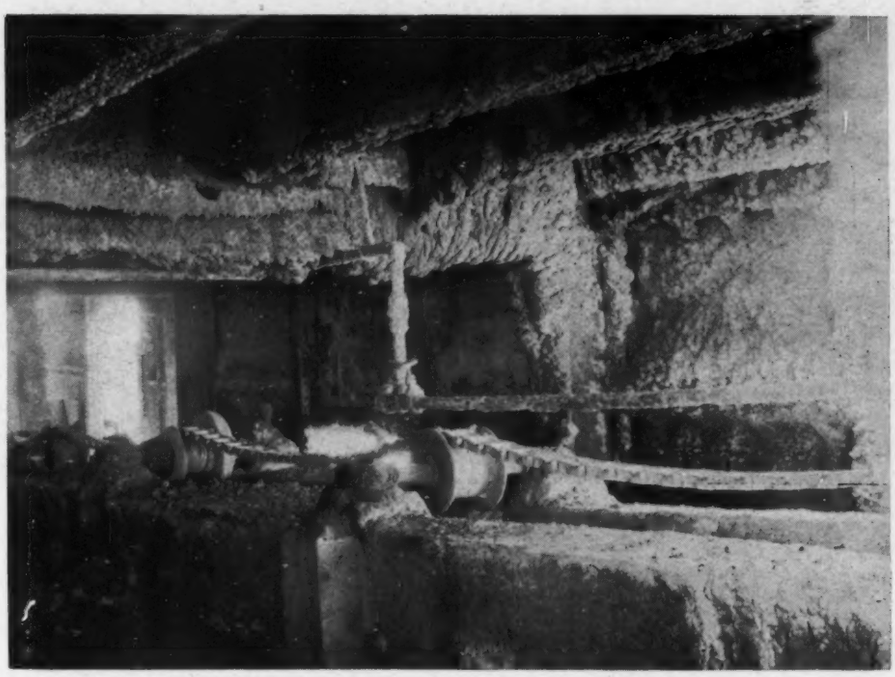
pipe-line keeping the gate cool, passes up a 2-ft. diameter pipe to this fan. Then it is discharged at the point where coal passes from the feed bin to the burner pipe. Here the coal is mixed with the secondary air from below and passes into the kiln.

It has been found that the most efficient combustion is realized when the volume of primary air is kept at a minimum—when it does not exceed 25% of the total volume of air used for combustion. On an average, 3500 cu. ft. of primary air is fed to the kiln per minute along with 11,000 cu. ft. of secondary air.

A panel board, located near the firing end of the kiln, has all the instruments necessary for the operation of the kiln and cooler with indicators and stop switches. A Foxboro Stabilog measures the secondary air, and a Hoskins recording pyrometer measures temperatures. The Foxboro Stabilog operates through a Venturi tube to measure the air, and 20 lb. of compressed air from the regular air compressor operates the air inlet automatically through the Foxboro. According to weather conditions and analyses of the chemist, the setting of the Foxboro is made by hand for any given condition. The amount of primary air is kept constant.

Hand controls at the bustle permit horizontal and vertical movements of the point of entrance of the coal, so that the flame can be directed to any part of the kiln. Also, the vane arrangement in the burner tip makes it possible to readily control the length of the flame.

Since the cooler installation was completed, the 150,000 bbl. clinker storage formerly necessary has been cut to barely any storage. The storage space formerly used will probably be used as additional storage for raw materials.

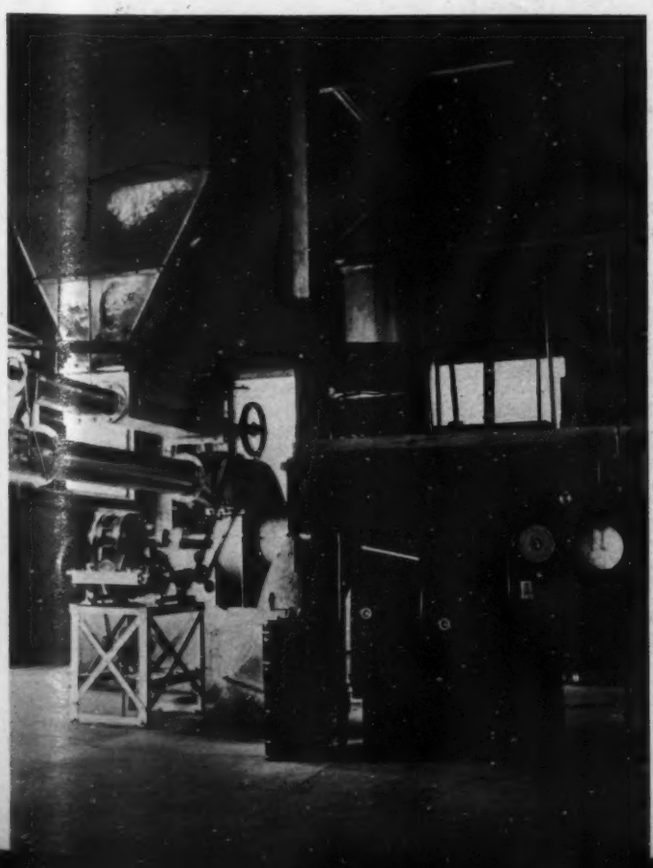


How the old clinker conveyor and cooler looked before improvements

The clinker now stored is ready for immediate grinding, and grinding of a cool cement has resulted in a cement with better setting time than would be obtained when hot clinker was ground. Free lime has been reduced from 1½ to less than 1% because of the more intense, thorough burning now possible. The kiln output has been increased 15%, as already stated, and a higher strength cement has been obtained. Strengths at 7 and 28 days have been increased 14% and 12½%, respectively.

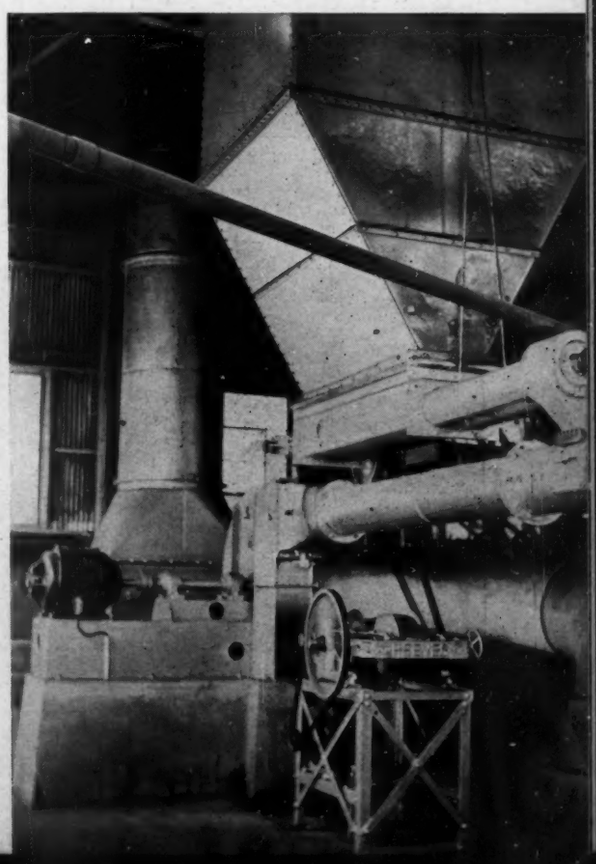
There has been a 15% saving in the fuel consumed. About 12,000 B.t.u. are realized from one pound of the coal used. Results show that the use of primary air from the cooler has saved one pound of coal per minute, or 12,000 B.t.u. per minute.

Another plant change being made is the installation of a size 5040 Dixie Mogul hammer mill with a rated output of 125 tons hourly. This secondary hammer-mill crusher is to be driven by a 125-hp. Allis-Chalmers slip-ring motor through a size 16CS Falk flexible coupling. Rock up to 4 in. from the primary crusher will be reduced to ¾ in. and under, by this hammer-mill. Rock will be fed to it by means of a Jeffrey-Traylor magnetic feeder.



LEFT — Panel board for cooler

RIGHT — Coal hopper and coal counter



Zanesville Gravel Co.'s new plant showing gravel tipple at left, sand unit in center and office at right

This is the Plant that supplies sand and gravel for the WILLS CREEK DAM

ZANESVILLE GRAVEL CO., Dresden, Ohio, last year built a sand and gravel plant to supply aggregates for the Wills Creek dam in the Muskingum river development project, which has interesting details, even if not as specatcular as those of the big plants in the West. The plant is on the Muskingum River near Conesville, Ohio.

Sand and gravel are excavated from the river bottom by a 1½-cu. yd. Sauerman slack-line cableway excavator with steam-driven hoist, and unloaded to a bar grizzly with 6-in. spacing. Oversize boulders are thrown off. Everything passing the grizzly goes to a primary scrubber 14 ft. long and 4 ft. in diameter, and then to a rotary scrubber screen, 30 ft. long and 3½ ft. in diameter. Everything below ⅜ in. is taken out by this screen. This through material goes over a single-deck Tyler Niagara, 3 by 6 ft.

Sand drag to bucket elevator leading to bins

Crusher and screen on new plant near Conesville, Ohio

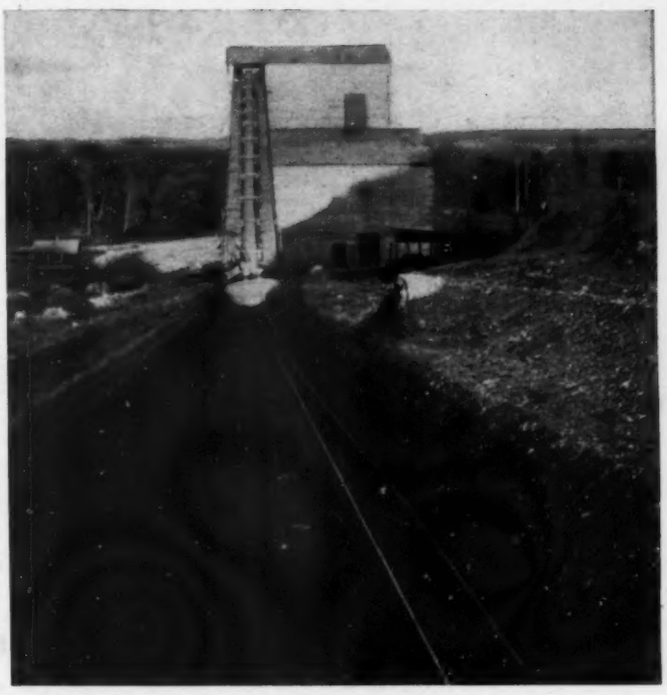
Another view of screen. Sand pump in background

vibrating screen and the pea gravel is removed. A home-made sand drag carries the sand to the foot of a Miller bucket elevator which discharges in a 70-ton Blaw-Knox steel bin. A Universal crusher crushes the larger sizes on the ground level.

When sand is not wanted it is pumped back to the river by a 6-in. Morris sand pump. This pump, which is driven by a direct-connected 50-hp. Westinghouse motor, takes the sand from the pit just below the vibrating screen.

Pea gravel, gravel and crushed gravel go up a 24-in. belt conveyor, 200 ft. centers, to a 4 by 8-ft. Tyler-Niagara, triple-deck vibrating screen, where the sizing takes place. The sized gravel goes by chute to a 4-way Blaw-Knox 300-ton steel bin, equipped with gates for truck loading. A 90-ton two compartment bin is used for reserve stocking in addition to the stock pile. Two Ford 4-ton trucks haul the gravel from the bins to stock pile. The plant has an average capacity of 70 tons of gravel per hour and 50 tons of sand each hour. The plant was constructed so that when the project is completed, it can easily be removed and set up at another location. It is equipped with a Truscon collapsible steel office building (12 by 19 ft), boiler house and storage building.

J. J. Gorman is president, treasurer and general manager of the Zanesville Gravel Co. and he has contributed the following data on the recent floods: "Were it not for the presence and active work of our Army Engineers we figure we would have had a worse flood in March than we had last August when the river completely surrounded our plant, 4 ft. deep in the office floor and 2 ft. in the boiler room. The engineers dynamited the ice jams, so we had very little of flood conditions in the Muskingum River Valley. With the dams now under construction in the Muskingum Conservancy District completed, we shall no longer live in fear of recurring floods."



View of bucket approaching foot of conveyor at Kalamazoo plant

The material discharges to a 3-barrelled cylindrical revolving screen 4 ft. in diameter, driven by a 25-hp. G.-E. motor by means of a Texrope drive. The inside barrel is 15 ft. long, the middle one is 11 ft. long and the outside barrel is 10 ft. long. The inner barrel has 1¾-in. round holes, the middle barrel has 1-in. holes and the outside barrel has ¼-in. by ¾-in. slots. The sand passes over a Niagara single-deck vibrating screen with ⅛-in. openings, driven by a 5-hp. G.-E. motor through a belt drive.

The minus 1-in. gravel passes over a Simplicity 3- by 6-ft., double-deck, vibrating screen, driven through Texrope drive by a 5-hp. G.-E. motor. Above 1¾-in. goes to a No. 5 Allis-Chalmers gyrating crusher driven by a 50-hp., G.-E. motor, Texrope drive. This crusher reduces the gravel to 1¼-in., and down, after which it is carried over a 4- by 8-in. Simplicity double-deck vibrating screen with 1¼-in. and ¾-in. openings. This screen is also driven through a Texrope drive by a 5-hp. G.-E. motor. The gravel retained on the 1¼-in. screen goes to a 36-in. Symons disc crusher driven by a 50-hp. G.-E. motor (through belt drive) and then to the 4- by 8-ft. Simplicity double-deck screen. The gravel retained on the ¾-in. screen goes to a 3- by 6-ft. Simplicity screen with 5/16-in. and 1/12-in. openings. Crushed gravel is furnished in (5/16- to 1/12-in.), (5/16- to ¾-in.) and (¾- to 1¼-in.) sizes. A 5-hp. G.-E. motor drives a 2- by 3-ft. single-deck Simplicity screen used for supplying 4 A gravel as specified by the state. Regular run gravel ½-in. down, 1-in. down, 2-in. down and 2½-in. down is also produced.

A sand-drag 20 ft. long by 4 ft. square made by the company and driven by a 5-hp. G.-E. motor is used in getting out the sand. Water is supplied from the river for washing by an 8-in. De Laval pump driven by a 75-hp. G.-E. motor with a flexible coupling. Water is pumped to the plant through a 12-in. pipe, cut down to a 6-in. for washing in the rotary screen, and to a 4-in. for the other screens. Gravel and sand are stored in 8 bins of 70 tons capacity each. Provision is made for loading trucks by chutes or for loading direct into the Pennsylvania Railroad cars.

Big Producer Builds New Small Plant

American Aggregates Corp., Greenville, Ohio, recently completed a new plant 8 miles north of Kalamazoo, Mich., some of the equipment being new and some being furnished from the plant dismantled 2 miles south of the new location. The old deposit ran out and the same ridge is being worked at the new site. The deposit averages 40 ft. in depth, with a 0-4 ft. overburden, which is removed by a Northwest 1-yd. gasoline-motor driven shovel.

The deposit is excavated by a 2-yd. Sauerman dragline bucket, operating as far as 800 ft. from the plant. A Thomas hoist, driven by a 100-hp. G.-E. motor, operates the bucket which discharges into a 35-yd. hopper. The hopper feeds to a 36-in. conveyor belt, 180 ft. centers, driven by a 25-hp. G.-E. motor with Texrope drive. The idlers are of Greenville Manufacturing Works, and the belt is of Ajax make.

View of new plant of American Aggregates Corp. Hoist house is at right

A ROCKFILL Order that taught me new things about BLASTING!

Says a Quarry Superintendent

Author's Note

***A CONTRACT** to supply rock for a breakwater or rock fill presented some interesting problems, inasmuch as it was a complete reversal of ordinary quarry practice of attempting to break the stone into fragments as small as possible. This job gave me an excellent opportunity to study the effectiveness of various types of drilling, blasting, loading holes, handling of rock, etc.*

One of the most pressing needs was to increase the drilling efficiency, so as to handle the requisite amount of snake holes in time for a blast to provide stone a few days in advance. This led to various sorts of combinations—straight snake holes, well-drill holes without snake holes, well-drill and snake holes in combination, straight wagon-drill holes, and wagon-drill and snake holes in combination. It also meant a lot of experimenting with powder charges to obtain the best results.

—THE AUTHOR.

IT IS QUITE COMMON quarry practice to use air drills for both vertical and horizontal holes for faces up to 40 or 50 ft.; but it is uncommon to pull a 102-ft. face in one lift, and still more uncommon to shoot 220 holes at one time. When the above combination of uncommon conditions produces over 15 tons of well fractured rock per pound of dynamite used, there is very likely an interesting story attached to it.

At one of the larger trap rock quarries in New Jersey, horizontal holes have been used alone, and also in combination with well-drill holes, for a number of years, and this practice gave uniformly satisfactory results. About six months ago, general dissatisfaction with the older type of screw-feed air drills led to a desire for something more

Fig. 1—Result of single blast, which brought down 46,000 tons of rock

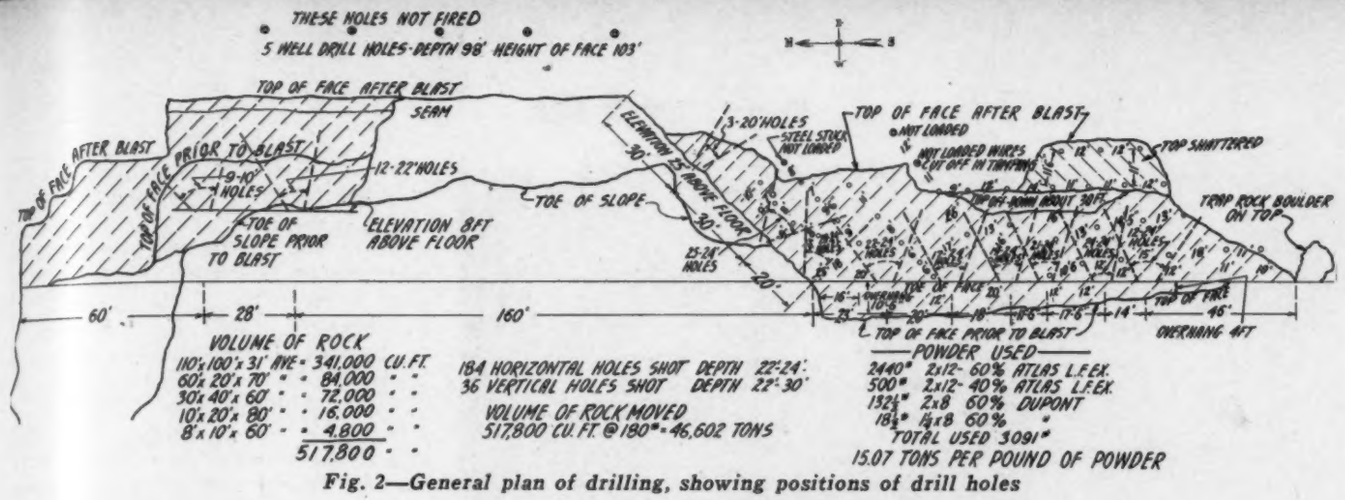

THESE HOLES NOT FIRED
5 WELL DRILL HOLES-DEPTH 98' HEIGHT OF FACE 103'
TOP OF FACE AFTER BLAST
SEAM
TOP OF FACE PRIOR TO BLAST
12-22' HOLES
9-10' HOLES
TOE OF SLOPE PRIOR TO BLAST
ELEVATION 8FT ABOVE FLOOR
TOE OF SLOPE
3-20' HOLES
STEEL STICK NOT LOADED
ELEVATION 25' ABOVE FLOOR
30'
15-24' HOLES
20'
TOP OF FACE AFTER BLAST
NOT LOADED
NOT LOADED WIRES CUT OFF IN TAMPING
TOP SHATTERED
TOP OFF BOOM ABOUT 30 FT
TRAP ROCK BOULDER ON TOP
60'
28'
160'
TOP OF FACE PRIOR TO BLAST
OVERHANG 4FT
VOLUME OF ROCK
110'x100'x31' AVE. = 341,000 CU.FT.
60'x20'x70' " " 84,000 " "
30'x40'x60' " " 72,000 " "
10'x20'x80' " " 16,000 " "
8'x10'x60' " " 4,800 " "
517,800 " "
184 HORIZONTAL HOLES SHOT DEPTH 22-24'
36 VERTICAL HOLES SHOT DEPTH 22'-30'
VOLUME OF ROCK MOVED
517,800 CU. FT. @ 180" = 46,602 TONS
POWDER USED
2440" 2x12- 60% ATLAS L.F.EX.
500" 2x12- 40% ATLAS L.F.EX.
132½" 2x8 60% DUPONT
18½" 1¼x8 60% "
TOTAL USED 3091"
15.07 TONS PER POUND OF POWDER

Fig. 2—General plan of drilling, showing positions of drill holes

automatic, something more positive, something which would cut faster; and as a result produce stone cheaper. Several competitive makes of air drills were tried on various parts of the quarry where different drilling conditions presented themselves. The operators of the drills were able to show very convincingly that the new drills were far ahead of the older ones in a number of respects.

Test Shot Explained

The success of the drills at the bottom of the face led to the trial of several air drills on top; wagon drills capable of handling drill steels up to 40 ft. in length were selected. A section of the quarry with a vertical face of 102 ft. and a horizontal width of about 400 ft. was selected for an experimental shot.

One hundred and eighty-four fan holes or "snake holes" and 36 vertical holes were drilled. These were loaded and fired simultaneously, giving perfect breakage, a clean toe and a total of over 46,000 tons of rock, or a trifle better than 15 tons per pound of powder. Figs. 1 and 2 give a very good idea of the tonnage in this blast. Some idea of the volume of stone brought down may be obtained from Fig. 1, showing a 2½-cu. yd. electric shovel loading a truck from the blast.

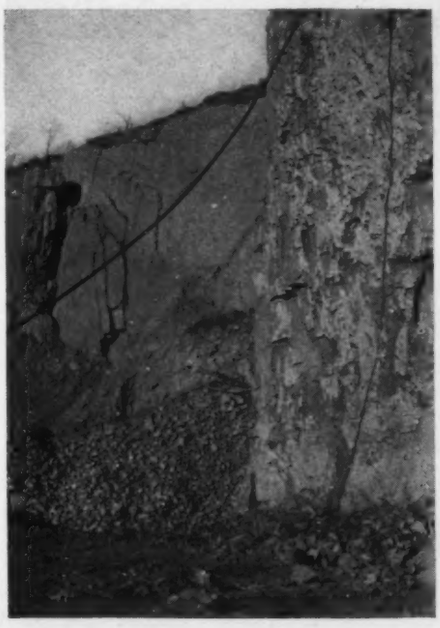


Fig. 2 shows the general plan of drilling employed. The shaded area indicates the rock brought down by this blast. The small circles on the shaded area to the right indicate the positions of the vertical holes, and the figures indicate the spacings. The fans indicate the approximate angle including the holes drilled at the bottom of the face. The shaded portion at the left side was brought

Left—Straight quarry face showing no toe. Below, Fig. 3—Set-ups and holes drilled for blast

Fig. 4—Close-up of one of the set-ups, which gives an idea of the fanning

Fig. 5—Toe shown coming out during a smaller blast

Fig. 6—Results of blast which brought down 18,000 tons of rock

down by 9 holes of 10-ft. depth and 12 holes to a depth of 22 ft. No vertical holes were drilled in this area.

At the bottom of the face, the air drills were mounted in a convenient spot at floor level, and from 12 to 24 holes, each 24 ft. in depth, were drilled. As far as possible, the holes were arranged in three rows, the top one of which ran upward at an angle of approximately 8 deg. The center row of holes was horizontal, while the lower row of holes declined at an angle of 4 deg. The holes were fanned from left to right within an angle of about 45 deg., and so spotted that no two charges of powder would be close together, and no two or more holes would be in a direct vertical line. Fig. 3 shows the setups and holes that were drilled. Fig. 4 shows a close-up of one of the setups and gives a good idea of the fanning.

Drilling Details

The top row of holes, which may be termed "back holes," are always drilled to a depth of 24 ft. This is considered important in order to break up the solid close-grained formation of trap rock. The center row, or cut holes, are usually drilled 24 ft., but occasionally it is advisable to stop a hole at 20 or 22 ft. in order to avoid seams or other conditions which may render the extra 2 or 4 ft. of drilling inadvisable. The lower row of holes, or lifters, are sometimes shortened to 16 ft., depending upon the time available for drilling, ground conditions, and the elevation of the drills above the quarry floor. Due to the attention given to bringing out the toe at each shot, little or no difficulty is encountered in setting up within a foot of the vertical face (Fig. 3). A small amount of hand labor quickly prepares a space about 5 ft. wide and 8 ft. back from the face for a set-up. This provides an absolutely rigid foundation for the drills, and no effectiveness of blow or efficiency of drills is lost due to a shaky tripod or poor mounting. With the old tripod drills, at least 30% of the efficiency was lost due to wear and vibration.

Figs. 4, 5, and 6 give an idea of the advantage of snake holes in bringing out the toe. These pictures were taken before, during and after a smaller previous blast. Fig. 5 shows the toe well on its way out, followed by clouds of dust and gases, while the top of the face has just begun to crumble. Some 18,000 tons of stone were crushed from this blast.

Fig. 7 shows the toe being thrown out during another blast, while the top is falling. Uniformly good results have been obtained for a number of years by the combination of top and bottom holes.

Vertical Holes

The majority of the vertical holes were drilled to a depth of 30 ft., with several of them going down 40 ft. The latter holes were drilled primarily to test the following:

(1) The ability of the air drills to sink holes to this depth.

Fig. 8—Wagon drills equipped with air hoist

(2) To determine the rate of drilling.
(3) Penetration, or feet per bit.
(4) Loss of gauge, etc.

Crucible Steel Co. of America "Crusca" detachable trap rock bits were used on the 40-ft. holes and proved very satisfactory.

Ingersoll-Rand detachable bits as well as Crusca bits were used between 20 and 30 ft. Both bits were satisfactory, and approximately 5 ft. of hole was obtained from each bit.

Sets of three forged steel bits were used to drill to a depth of 20 ft.; a 6-ft. starter, a 12-ft. second and a 20-ft. third. The sizes of bits used in the vertical holes were as follows:

Depths	30 Ft.	40 Ft.
0- 6 ft.	3 7/16-in.	3 7/16-in.
6-12 ft.	3 5/16-in.	3 5/16-in.
12-20 ft.	3 1/16-in.	3 1/16-in.
20-25 ft.	2½-in.	2½-in.
25-30 ft.	2¼-in.	2⅜-in.
30-35 ft.		2¼-in.
35-40 ft.		2⅛-in.

The wagon drills are equipped with an air hoist for the quick handling of both steels and drill. Vertical drilling was done approximately in the same manner as horizontal drilling from a footage standpoint and was a much simpler operation. Figs. 8 and 9 show two of the wagon drills at work on top of the quarry. The table below gives the results of vertical drilling for the two machines shown. These figures are actual measurements, and the time as shown was a cross-section of the drilling at random times of day. The moving time required has been counted as part of drilling time. The variation in the rate of drilling may be accounted

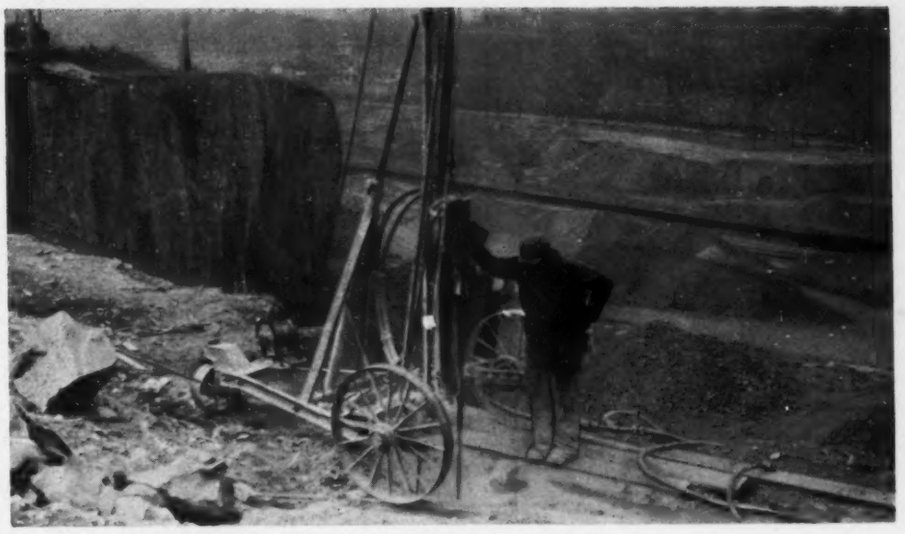


Fig. 9—View of wagon drill used at top of quarry

Date	Machine "A" Time Observed	Feet Drilled	Feet Per Hour	Machine "B" Time Observed	Feet Drilled	Feet Per Hour
Jan. 14	1 hour	20	20	.....	..	....
Jan. 16	2 hours	26	13	.....	..	....
Jan. 17	2½ hours	40	16	.....	..	....
Jan. 18	1 hour	10	10	.....	..	....
Jan. 31	3 hours	56	18.6	.....	..	....
Feb. 5	3½ hours	62	17.7	.....	..	....
Mar. 7	6½ hours	83	12.75	.....	..	....
Mar. 9	7 hours	71	10.14	.....	..	....
Mar. 10	8 hours	77	9.63	.....	..	....
Mar. 13	8 hours	70	8.75	.....	..	....
Mar. 14	6½ hours	86	13.2	4 hours	50	12.5
Mar. 15	7 hours	96	13.7	8 hours	80	10
Mar. 16	7½ hours	132	17.6	6 hours	115	19.15
Mar. 17	2 hours	26	13	2½ hours	35	14
Mar. 20	5½ hours	92	16.75	5½ hours	67	12.18
Mar. 21	1 hour	24	24	1 hour	16	16
Average feet per hour			14.68			13.97

Fig. 7—Toe being thrown out during a blast

for by stuck steels, variations in size of hole, dull steels, weather conditions and the temperament of the driller.

The convenience in moving and speed of setting up are remarkable compared to the well or churn drill. The cost of drilling; the time necessary for preparation of blasts, etc., are approximately 60% of previous methods, while fragmentation of stone is greatly improved because of a wider distribution of powder charges.

Horizontal Drilling

The greatest improvement noted was in the drilling of horizontal holes. Three air feed machines were chosen and results tabulated. Two of the machines had 4-ft. steel changes and one had a 6-ft. feed. The forged steel bits used were shaped and tempered in the quarry company's own shop, and it was found that instead of running 2 ft. changes with the additional steels and consequent additional sharpening, 4 ft. changes were practicable. With the 6-ft. change, the bits became dull and gauge wear excessive before the 6 ft. were completed. For a rock softer than a close grained trap, weighing 186 lb. per cu. ft., the 6-ft. change would unquestionably show a further economy.

The table below shows the difference between the 2- and 4-ft. changes. Since the 4-ft. change has proved itself entirely satisfactory and far superior to the 2-ft. change, the size of bits was changed to take advantage of the wider wings on the bits. On the 4-ft. change, the bits start at 3 1/16 in. and bottom at 2 7/16 in., all having 1-in. wide wings instead of ¼-in. as exists on bits from 2 5/16 in. down.

TABLE SHOWING ADVANTAGES OF 4-FT. DRILL CHANGE OVER 2-FT. CHANGE

2-Ft. Change				4-Ft. Change			
Length of Steel	Size of Bit	Area of Hole Cut (Sq. In.)	Volume of Hole Cut (Cu. In.)	Length of Steel	Size of Bit	Area of Hole Cut (Sq. In.)	Volume of Hole Cut (Cu. In.)
2 ft.	3 7/16-in.	9.2806	222.7344				
4 ft.	3 5/16-in.	8.6179	206.8296	4 ft.	3 1/16-in.	7.3662	353.5776
6 ft.	3 3/16-in.	7.9798	191.5152				
8 ft.	3 1/16-in.	7.3662	176.7888	8 ft.	2 15/16-in.	6.7771	325.3008
10 ft.	2 15/16-in.	6.7771	162.6504				
12 ft.	2 13/16-in.	6.2126	149.1024	12 ft.	2 13/16-in.	6.2126	298.1848
14 ft.	2 11/16-in.	5.6727	136.1448				
16 ft.	2 9/16-in.	5.1572	123.7728	16 ft.	2 11/16-in.	5.6727	272.2896
18 ft.	2 7/16-in.	4.6664	111.9936				
20 ft.	2 5/16-in.	4.2000	100.8000	20 ft.	2 9/16-in.	5.1572	247.5456
22 ft.	2 3/16-in.	3.7583	90.1992				
24 ft.	2 1/16-in.	3.3410	80.1840	24 ft.	2 7/16-in.	4.6664	223.9372
Theoretical volume of hole cut = 1752.7152 cu. in or 1.0143 cu. ft.				Theoretical volume of hole cut = 1720.8856 cu. in or 0.9957 cu. ft.			

The difference in the theoretical volume of the holes drilled with 4-ft. changes of steel is 1.816% less than the same 24-ft. holes using 2-ft. changes. Half as many steels are required and half as many sharpenings. In actual practice, the volume of the hole drilled would easily be 15% greater than the calculated volume.

Changing to 4-ft. feeds means a possibility of adding a 28-ft. steel to the set and gaining an additional 4 ft. of rock at each blast. The 28-ft. steels have been forged and holes drilled with them, but unfortunately, at the present time no blast has yet been fired testing the ability of the 28-ft. hole to move the added burden. No difficulty has been encountered in drilling, forging or handling the extra length of steel, and a heavier charge of dynamite should take care of the extra tonnage.

Improvement in Drilling

During an "observation period" of six months, accurate daily records were kept of the footage drilled by each of the older screw feed drills having 2-ft. changes, and the results were tabulated. One of the drills gave an average of 5.84 ft. per hour over the first three months and 5.14 ft. during the following three months. A second machine gave 5.11 ft. per hour over a period of two months and 4.83 ft. per hour over the following four months' period. The decrease in footage was unquestionably due to gradual wear within the machine and consequent loss of efficiency.

The new 4-ft. air feed machine was placed in operation in the same location as the

The two end views show drill holes of set-ups in detail. The center photograph, taken after blast, illustrates the excellent fragmentation obtained

screw feed tripod drill and immediately showed an increase of 7.56 ft. per hour in the rate of drilling.

Over a period of three months, one of the new drills averaged 19.381 ft. per hour or 3.8762 in. per minute. The other machine averaged 15.816 ft. per hour or 3.1232 in. per minute over a period of two months. Both machines were given a thorough workout in all sorts of conditions; solid rock, loose, wet, sticky, shattered, seamy and porous. The rate of drilling was improved 370.5%. The Worthington "Rockmaster" was selected as having given the most satisfactory performance and was the choice of the five drillers employed. On the vertical holes, the Worthington wagon drill likewise outdrilled and outperformed competitive machines.

Loading of Holes

The loading of holes for a blast is an equally interesting study. Two different strengths of powder are usually employed, a 75% and 60% combination or a 60% and 40% combination. Two-inch diameter cartridges 12 in. in length are used. These are packed in 50-lb. boxes and each stick weighs 2 lb., so an easy check is provided.

All the back holes, or top row of snake holes, are loaded with the higher strength powder. The center row, or cut holes, are loaded with either one of the powders, depending upon the rock formation, grouping, number and depth of holes. This is a matter which must be determined for each quarry by careful observation of the results obtained and by careful planning of future blasts. The lower strength powder is always loaded in the bottom holes or lifters. This method of loading has proved much more satisfactory than uniformly loading all holes with the same strength of powder.

Another variable entering into the problem is, "how much powder per hole?" This, too, must be determined for each quarry by experiment. In some holes, 4 or 6 lb. (two or three sticks) will be sufficient, while in others it will be found advisable to use 20 to 26 lb. In back holes having an angle of less than 45 deg. from the face, it is advisable to reduce the powder charge. Care must likewise be exercised when grouping holes not to concentrate too much powder in any one spot. The driller should so place the hole that concentration is not likely; but the loader must use discretion and vary the load if such a condition appears. Overloading of any spot will cause a tunneling effect and spray the broken stone over a wide area.

Vertical air drill holes were loaded with the more highly concentrated dynamite, and the cap placed near the top of the column of powder. Loads again varied considerably. From 4 to 16 sticks were used in the vertical holes, depending upon the depth of hole, distance from the face and condition of the rock or burden to be moved. No hard and fast rule can be given for the amount of dynamite to be used. Experience with a certain rock or in a certain quarry alone must be the basis upon which blasts are planned.

The actual loading of the holes is an important job. Great care must necessarily be exercised to insure satisfactory results. In loading the snake holes, each stick of powder must be rammed tightly against the preceding one. For holes up to 16 ft., it is customary to slit the paper covering or to remove one or one-and-a-half wraps of the paraffined covering. On longer holes, sharp stones or other obstructions may cut the covering, and a difficult loading problem then presents itself. Holes should be blown out by air just prior to loading, and a tamping stick a trifle larger in diameter than the powder stick to be used should be rammed "home" before any powder is inserted into the hole. The cap or exploder is usually placed in the next to the last stick of powder nearest the face. This gives one stick to tamp on before striking the cap.

Powder may be dropped into vertical holes and should be tamped into a solid compact mass for best results. The exploder is again placed in the next to top stick of powder as a precautionary measure.

Tamping

Tamping of vertical holes is a simple matter. Sand or stone dust is dropped into the hole and tamped down as the tamping stick is removed. Some very fine results have been obtained by using several feet of mineral filler or "float" from the dust collector and pouring water into the hole on top of this float. This is done on both well-drill holes and air-drill holes. A collar several feet in thickness is thus provided above the dynamite and this prevents any loss of the gases due to porous or insufficient tamping. The hole is then filled in the usual manner and tamped well.

Tamping horizontal or snake holes can be done only if the sand or dust is confined in some form of bag or tube. The older method of rolling a newspaper or magazine or pages from the Sears-Roebuck catalog around a pipe of approximately the required size is quite expensive, although still very extensively employed. Any number of paper bag manufacturers make a satisfactory brown paper bag which measures 4 by 13 in., and when filled and tucked in at the top end provides a most excellent tamping bag. These bags may be purchased for around $1.50 to $1.75 per thousand, and may be filled and stored in empty powder boxes ready for use.

Tamping is always run out to the face of the quarry or top of a vertical hole as a precaution against a skipped hole on the part of the tampers. A horizontal hole should always have plenty of tamping on top of the powder, a safe rule being to have a little more tamping than powder. If there is 10 ft. of powder in the hole, at least 10 ft. of tamping must be used.

Electrical Connections

All blasts are fired by electricity; 440 volts being used for this purpose. On most shots, a series-parallel combination is usually employed. Eight or ten vertical holes are connected in series and the ends of the series connections are hooked across the leads. Two No. 12 rubber covered leads are dropped over the edge of the face to the horizontal holes below. Twenty-four ft. exploders are used on both vertical and horizontal holes, and while occasionally longer than really necessary, they are advantageous because of the extra length of lead wires.

In the recent blast previously described, where 184 snake holes and 36 vertical holes were fired, the snake holes were divided into eleven groups. These were connected into a parallel-series combination, each group containing from 12 to 20 exploders. The leads were then still further divided and hooked to all three phases of the electrical power line instead of across a single phase as is customary. This gave a much better distribution and eliminated any doubt as to whether 220 holes could be fired simultaneously.

Conclusions

The possibilities for improvements in drilling and blasting are numerous, and any time or attention given to a careful and conscientious study and analysis of present methods and results must unquestionably lead to a much improved practice in both of these fields and in turn to a greatly reduced production cost.

Settle Income Tax Cases

Louisiana Quarry Co. (now extinct) officers who were accused by the federal internal revenue collector at New Orleans, La., some months ago, of evading income taxes growing out of business received from the Louisiana state highway department, have been released from prosecution by payment of the taxes claimed. The records are supposed to have shown that all the money paid by the state for stone did not show up in company income, that some was used to bribe certain state officials. The federal government did not recognize this as a legitimate cost of doing business with the state.

Moving Plant

Tennessee Valley Authority, Knoxville, Tenn., is moving its rock-crushing plant, which received so much publicity at Norris dam, to the new Chickamauga dam site. This plant consists of a primary crusher, secondary crusher, a classification plant which screens the crushed rock into four sizes, four hammer mills which reduce smaller sizes of stone into two sizes of sand, a series of Dorr sand classifiers and a system of belt conveyors that tie all these units into one integrated plant.

Plant Burned

Consumers Co., Chicago, Ill., crushed-stone plant at McCook, Ill., was damaged by fire to the extent of $40 000 on April 26.

West Coast Operating at Higher Percentage of Capacity

CEMENT MANUFACTURING CAPACITY on the West Coast is being utilized at much higher percentage than the average for the country as a whole, according to an article in the *West Coast Edition of the Wall Street Journal* (San Francisco, Calif.) by H. C. Hendee, who writes:

"California's cement mills turned up to an average of 63% of capacity operations in April and have probably continued to run at not far from that level since that time, new figures on the Coast industry show. In the Pacific Northwest operations also advanced again, although not quite at the California rate, reaching an indicated 51% of capacity.

"Both production and shipments expanded sharply, continuing the steep rate of increase evident in March. Stocks in the Pacific Northwest continued to be pulled down by the heavy shipments for federal works, but in California production and shipments came closely into balance and there was no appreciable change in stocks, which now appear to represent about 30 days' supply.

"Estimates of the Bureau of Mines indicate that the average mill value of cement produced in California for the first quarter this year was about $1.40 per bbl., which compares with $1.91 a year ago. The national average for April was a little better than $1.50.

"A considerable part if not all of the low California average, which is calculated before discounts and before application of any container costs, is attributable to the low southern California market which, although again stabilized, has not recovered to anything like its former levels.

"In the Pacific Northwest, the average first quarter mill price this year may be calculated at about $1.70 per bbl., as against $1.85 in the first quarter of last year. The reduction appears to be due chiefly to the extent of low-price Government contracts, the Grand Coulee deliveries, before discount, running to a mill price of about $1.38.

Reopen Old Quarry

Hollis B. Peck, Copperopolis, Calif., has reopened a slate quarry which was abandoned 60 years ago, and is producing and selling stepping stones and flagging. He expects to produce slate shingles soon.

Crushed Stone Sidelines

Alabama Marble Co., Gantts Quarry, Ala., is reported now to be filling many orders for a finely pulverized byproduct for use in chicken and stock feeds, paint filler, etc., and for agricultural limestone.

Developing Water Supply

British Columbia Cement Co., Ltd., Bamberton, B. C., is spending $60,000 on a water-supply project, including construction of four dams and a 2000-ft. tunnel.

Highest in Five Years

REPORTS of the F. W. Dodge Corp. to PWA Administrator Ickes showed that privately financed construction projects in April of this year in the 37 states east of the Rocky Mountains amounted to $130,072,000—the highest figure in five years.

The March, 1936, total for privately financed construction was $102,651,000, while in April of last year this class of construction amounted to only $71,428,200.

Publicly financed construction jobs in the 37 states amounted to $104,734,300, the special report stated, compared with $96,327,300 for the previous month and $52,591,800 for April, 1935. PWA allotments were an important factor.

Total construction, both public and private, in April amounted to $234,806,300. Mr. Ickes was informed that this was the largest volume reported for the area east of the Rocky Mountains since October, 1931, except for December, 1935.

In the first four months of 1936 construction totaled $780,627,600, a gain of 85% over the total of $421,781,500 for the corresponding four months of 1935.

Thus far this year, the corporation said, public projects have accounted for 54% of the total value of construction in the area covered, while in the same period last year they represented only 50% of the total.

Improved Business

National Gypsum Co., Buffalo, N. Y., business for the first four months ran about 15% ahead of the combined sales of the company and its recently merged Universal Gypsum and Lime Co. in the like 1935 period. Profits are understood to be making a good record, the company having been well in the black for the period, notwithstanding that the initial two or three months of the year normally yield little or no earnings to building materials manufacturers. Also, conditions were further aggravated by unusually severe weather and floods. Prices of National Gypsum's products, except in certain items, in the metropolitan New York market continue approximately at the same level as a year ago. Present gypsum prices are about 20% under those of 1926, but this is largely offset by reduced costs as the result of improved methods of manufacturing.

Leases Quarry

Builders' Material Co., Cedar Rapids, Ia., has leased from the Lake and Park Holding Corp., the quarry southwest of Gladbrook, and is preparing to fill an order for approximately 20,000 cu. yd. of crushed stone for local highway improvement. S. P. Moore is president of the Builders' Material Co.

Plant Reopened

Central Silica Corp., Collingwood, Tenn., has resumed operation after having been closed for several months.

Should Help to Get Small Orders

UNITED STATES Bureau of Public Roads has prepared for free distribution a pamphlet, "Construction of Private Driveways."

Drives of stone, gravel, bituminous material, concrete and brick are described. Drawings and photographic illustrations show several kinds of "ribbon" surfaces and full-width surfaces with dimensions. The pamphlet includes tables for rapid estimating of quantities of materials. For example, a gravel or crushed stone drive, 6 in. thick and of the ribbon type will require about 9.5 cu. yd. of material per 100 ft. of drive, assuming 10% shrinkage of material due to compaction. If crushed stone or gravel costs $1.50 per cu. yd., then material for the drive will cost $14.25. Similarly, full width surfacing will require 14.3 cu. yd. and the material will cost $21.45.

One type of concrete drive, 5 inches thick of the ribbon type requires 6.2 cu. yd. per 100 ft. of drive and full width surfacing requires 10.3 cu. yd.

New Plant

Monsanto Chemical Co., St. Louis, Mo., will spend $600,000 on a new phosphate rock treating plant at Columbia, Tenn.

More Cement Plants in Production

Northwestern States Portland Cement Co., Mason City, Ia., resumed production May 4, following a six-weeks' shutdown.

Lehigh Portland Cement Co., Allentown, Penn., resumed production at its Mason City, Ia., plant May 11, after a shutdown since February 11. Production was resumed at its Oglesby, Ill., plant May 10, closed since November, 1935.

Wabash Portland Cement Co., Detroit, Mich., reopened its Stroh, Ind., plant May 13. Glenn Hall is superintendent.

Ash Grove Lime and Portland Cement Co., Kansas City, Mo., resumed production at its Louisville, Neb., plant, after a three-months' shutdown, on April 29.

Wolverine Portland Cement Co., Coldwater, Mich., resumed production at both its Coldwater and Quincy plants late in April. The Quincy plant is reported to have been shut down for four years.

Alpha Portland Cement Co., Easton, Penn., resumed production at its Jamesville, N. Y., plant May 1, after having been shut down since November 1, 1935. E. L. Boyne is plant manager. The plant has an annual capacity of 500,000 bbl. and is said to be scheduled at present for 55 to 60% capacity.

Petoskey Portland Cement Co., Petoskey, Mich., resumed production April 23, after a shut down since September 30, 1935.

Medusa Portland Cement Co., Cleveland, Ohio, resumed production at its Dixon, Ill., plant May 4, after several months' shutdown.

This GRAVEL *Will* Become MISSISSIPPI Roadway

Two Southern Plants Prepare to Supply Road Building Contractors

By Bror Nordberg,
Associate Editor, Rock Products

Wash-water pump house and motor

MISSISSIPPI has a large highway building program, for which farsighted producers began making preparations in 1935. Herewith are descriptions of two new plants, which are typical of this locality.

Allen Gravel Co.

The Allen Gravel Co. completed a new screening and washing plant at Iuka, Miss., capable of a production of 15 to 20 cars per 10-hour day, in April, 1935. The old screening plant was located near the site of the new one, but produced only unwashed sand and gravel. The deposit being worked is the same one used at the old location, and extends to considerable depth with no overburden.

A Northwest gasoline-driven drag-line, with a 45-ft. boom and 1½-yd. bucket, loads directly into trucks traveling on all-weather roads to the working areas. The pit is equipped with two Chevrolet and one International motor trucks, all with end-dump gates. These trucks carry 1½ yd. each to the grizzly, which has an inclined roadway leading up to it and down the other side, so that the trucks come up the grade, unload, and go down the other side. The grizzly consists of steel rails spaced 6 in. apart.

Everything passing the grizzly goes direct to a 20-ft. twin McLanahan & Stone log washer. The log washer is driven by an 80-hp. G.-E. motor through a system of gears. Water is supplied at the logs by an 8-in. Fairbanks-Morse pump driven by a 40-hp. G.E. motor. The pump is located in an old excavation near the plant, which has filled with water, and pumps 1700 g.p.m. to various points. A considerable portion of the fines passes from the lower end of the logs through a ditch back to the lake.

The material, after passing through the logs, discharges to a Stephens-Adamson 36-in. belt conveyor, 135 ft. centers. The belt, which has a travel of 420 lin. ft. per min., is driven by a 30-hp. G.E. motor. The material, after passing up the 15-deg. incline, discharges directly to a 4 x 8-ft. double-deck Link-Belt vibrating screen. The material is washed again at this point. Four sections of perforated 2-in. pipe pass over the screen transversely and wash the material as it passes down the screen. Water is supplied by the Fairbanks-Morse pump. The upper deck of the screen is a ½-in. wire mesh and the lower is ¼-in. Gravel not passing the ½-in. screen passes to another double-deck Link-Belt 3 x 8-ft. vibrating screen. The throughs, which are retained on the ¼-in. screen, pass to a 25 to 30-yd. capacity bin. All bins of the plant are of this size. The throughs of the lower deck pass through a wooden trough beneath the screen to a 12-ft.

New plant of Allen Sand and Gravel Co., Gravel Siding, Miss.

Log washer, 6-in. grizzly, conveyor belt to screening plant and incline to grizzly at new Allen plant

diameter Allen cone used to dewater the fines. The overflow passes through a flume to the sump.

The second Link-Belt screen has a 2-in. mesh on the top deck and ½-in. on the lower deck. Oversize passes to a trough below into a bin. Gravel retained on the lower deck goes to a bin. Both screens are driven by a 10-hp. Fairbanks-Morse induction motor through a 6-in. belt drive.

Provision has been made at the bins for loading directly into cars below or for dumping on the ground, when a ¾-yd. steam-driven Erie shovel is used for picking it up and stock-piling.

An Allis–Chalmers Newhouse crusher is installed at ground level next to the plant, and the oversize gravel is crushed to any desired size. A bucket elevator carries the crushed gravel back to the screening plant.

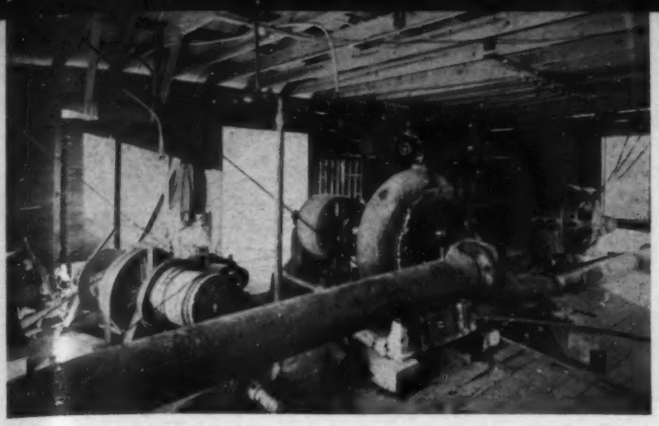
Golden Sand and Gravel Supply Co.

C. D. Carter has just completed a sand and gravel dredging plant at the site of the old Golden Sand and Gravel Co. pit, 2 miles out of Golden, Miss., last operated in 1929. Forty acres of land has been leased on a royalty basis. Since the site has been worked before, there is no overburden. Forty-foot test holes have not reached the bottom of the deposit.

The deposit averages 50% sand and 50% gravel, all material produced varying from fines to 2-in. About 80% of the gravel runs from ⅝ to 2-in.; 20% of the material is oversize (over 2-in.) and pea gravel, while most of the sand is mortar sand.

The plant is electrified, power being bought from TVA. The dredge is 30 ft. long by 24 ft. wide by 4 ft. deep and is entirely of wood. An 8-in. Amsco pump, with 8-in. suction and 8-in. discharge, excavates the material. It is driven by a 100-hp., 3-phase, Fairbanks-Morse induction motor, operating at 2200 volts, through a 12-in. belt with 11-ft. 8-in. centers. Both the suction and the discharge pipes are equipped with pressure gauges.

Below, left: Screens and washing pipe. Center: Trough taking throughs from screen to settling cone. Right: Cone used as settling tank for sand: Allen Gravel Co.



Left: Pump and motor on dredge boat of Golden Sand and Gravel Co. Right: View in boat from stern end, showing pump and timber boom

The suction end of the pipe line is handled by a 20-ft., 8-in. wooden beam and a Clyde two-drum hoist driven by a 50-hp. Wagner motor. The dredge is equipped with a Fairbanks-Morse 1½-in. centrifugal priming pump driven by a 2-hp. Westinghouse motor.

The sand and gravel is pumped through 110-ft. of discharge pipe to the top of the plant, which has been rebuilt from the old one (wooden framework only, new equipment), where it is discharged on a ⅛-in. mesh tilting stationary screen, 5½ ft. by 6 ft. Dewatering takes place here, and the fines and excess water pass to a 24-in. flume. Material not passing this ⅛-in. screen goes to a 5-ft. long Stephens-Adamson conical scalping screen of 44-in. diameter tapering to 28 in. The gravel not passing this 2-in. screen goes to a wooden trough and discharges as waste gravel on the ground below.

The throughs pass by an 18-in. trough to an identical screen, in size, at a lower floor level, which has ⅝-in. openings. The material passing this screen goes to another similar screen with 5/16-in. openings. The throughs pass to concrete sand bins below. Likewise the other gradations pass to their respective bins. The three screens are driven by a 10-hp. Lincoln motor by means of a chain drive.

Two waste water flumes pass one on each side of the plant, parallel to the bins, and lead to a 175-ft. master flume 22 in. wide, which carries all waste fines and water from the plant. Adjacent to the sand bins, a hole has been cut in the bottom of each flume and a ⅛-in. screen, 18 in. wide by 44 in. long, has been placed over one hole, and a similar one with ¼-in. openings over the other. Considerable of the fines pass through these screens to small dewatering hoppers. The run-off from these hoppers goes to the master flume, and each can be emptied into its proper bin, after settling. The plant is equipped with one 80-yd. bin and six 40-yd. bins.

Big TVA Contract

American Aggregates Corp., Greenville, Ohio, was recently awarded a contract for 296,000 tons of pebble aggregate, and 154,000 tons of sand aggregate, by the Tennessee Valley Authority, for use in constructing the Guntersville dam, on the Tennessee river, 90 miles downstream from Chattanooga. The price for the pebble aggregate is 50c. per ton and for sand 60c. per ton. The agreement, however, provides that TVA is to place in storage as much as 200,000 tons in excess of current requirements, and is to receive the material at the rate of 5000 tons per day.

American Aggregates Corp. will use one of its 16-in. rotary suction, Diesel-electric dredges for excavating the material and delivering it to a floating screening and washing plant, which will be mounted on a steel barge. The plant will consist of an arrangement of four sand classifiers designed to make one sand from 100-mesh to 30-mesh and one 30-mesh to 4-mesh—perhaps the first time a sand split at 30-mesh has been made on a floating plant.

Together with the classifiers will be four screw conveyors, or dewaterers, for handling the sand from the classifiers to the belt conveyors, which in turn load barges alongside.

The primary scalping will be done on a very large heavy grizzly. This will be followed by flat vibrating screens for rewashing and sizing the pebbles. The screens will deliver direct to belt conveyors which will load barges. The screening plant is designed for a capacity of 300 tons per hour. The plant will be assembled about June 10 and production is expected to start July 1.

New Operation

Tri-State Gravel Co., Lexington, Miss., has leased 400 acres of land at Tehula. C. T. Cully, Greenville, and W. A. Delaney, Columbia, are officers.

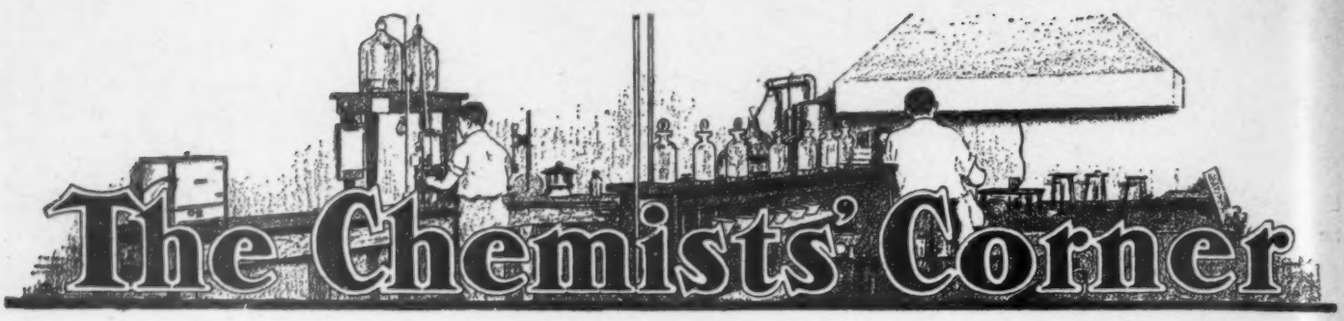
Pumping Plant

Kerstens Sand and Gravel Co., McComb, Miss., composed of J. C. and David Kerstens, has built a sand and gravel plant on Bogue Chitto river, 7 miles east of McComb. It is a 6-in. pumping operation with a capacity of about 200 cu. yd. per day.

New Location

Bagenstos & Hunter, La Porte City, Ia., have established a new sand and gravel plant at the Cedar river bridge—a pumping operation.

Dredge boat of Golden Sand and Gravel Co., Golden, Miss.



An *Accelerated* DETERMINATION for the Sulphate Resistance of Portland Cements

By H. McC. Larmour,* Eugene McMaster† and Otto C. Frei†

Yosemite Portland Cement Corp., Merced, Calif.

THE INCREASING DEMAND for a desirable "sulphate resistance" portland cement for the California markets has influenced a number of cement manufacturers to endeavor to meet these requirements. Our interest in this new demand was primarily concerned with acceptance requirements, types, and process of modifying the cement, and the necessary testing period prior to developing a cement of this type.

Studies of the problem included a survey of past investigations, beginning with Vicat 1837 and including investigations to date.

It is interesting to note that prior to 1837 the failures of concrete in aggressive waters had already provoked controversy along with suggested means of correction. Vicat mentions in the preface to his "Treatise on Calcareous Mortars and Cements" numerous modifications to the current cement mortars for increased resistance. These modifications included:

(1) Intergrinding pozzuolanic material.

(2) Intergrinding desirable calcined silicates.

(3) Intergrinding smithy slag and iron dross.

It is to be noted with much interest that present-day opinions are quite divided as to methods of increasing the resistance of portland cement to aggressive solutions. This division is readily seen in today's modified cements wherein "puzzuolanic" intergrinds vie for advantage with portland cements modified in composition.

Modification in the composition of portland cements, for sulphate resistance, is first noted in 1901 in the manufacture of "Sidero" cement, a German product, having an iron oxide equal to or greater than the alumina content.

Ordinary Tests Require Long Time

The above, in a general way, depicts the past and present trend towards increasing the sulphate resistance of portland cement.

*Chief Chemist; †Associate Chemists.

Among test methods for sulphate resistance, no appreciable progress has been noted, no information is evident relative to testing procedure, other than field observations or immersion in strong or concentrated aggressive solution requiring long periods of time.

The detail of required time for test results has unquestionably caused conflicting opinion in matters of investigation and has most certainly retarded the studies due sulphate resistance by the cement manufacturer.

It is evident that the manufacturer desiring to develop a sulphate resistant cement, to meet current competition, cannot wait a year or more for quantitative results. The most desirable approach was toward an accelerated test, that would give quantitative results within a more reasonable time period.

In general, investigators believe that lack of sulphate resistance is confined to the R_2O_3 group and is more or less dependent on its mineralogical composition in the portland cement. The mineralogical compounds in portland cement as calculated from the oxide analysis are probably only indicative of the compounds as they actually exist in the cement clinker. The incomplete formation of these desirable compounds in some cements is responsible for deviations from the general trend. Dalton G. Miller and Phillip W. Manson note these deviations on page 41 of their Technical Bulletin No. 358, U. S. Department of Agriculture, June, 1933.

Suggested Accelerated Test

Consideration of the findings of the various investigators convinced us that our immediate requirement was the development of an accelerated test for the quantitative determination of "sulphate resistance" for portland cements. Previous investigations indicated in general the relation between the R_2O_3 group and the sulphate resistance. If the R_2O_3 group were the compounds affected by the aggressive solution, then we could resort to temperatures below the critical hydration temperature of these hydrates in their simplest form, as a means of increasing the absorption of the test specimen.

Ferric hydrate was found to decompose at 930 deg. F. while aluminum hydrate decomposes at 570 deg. F.

It is therefore apparent that any temperature below 570 deg. F. could be used for driving off free and loosely held water without causing progressive destruction of the hydrated compounds. We arbitrarily selected 400 deg. F. as the dewatering temperature for a series of test specimens for a study on the effects of heating without immersion in sulphate water. This series then was composed of four cements having calculated C_3A and C_4AF values of:

(1) C_3A 0.50%; C_4AF 17.30%.

(2) C_3A 8.00%; C_4AF 6.30%.

(3) C_3A 11.00%; C_4AF 6.80%.

(4) C_3A 14.00%; C_4AF 7.20%.

Test specimens were two by four cylinders made from a one to three sand mortar at a 0.9 W/C. These cylinders were made without caps at the time of moulding and were capped with a sulphur-silica capping compound prior to crushing. The 2 by 4 mortar specimens were divided equally, one set being the reference, stored in damp air for 24 hours, then immersed in water for 20 days and crushed for 21 day results. The remaining cylinders were kept in water in sealed cans and broken at 28, 35, and 42 days. The results are:

TABLE A

	1. 0.5 C_3A 17.3 C_4AF	2. 8.0 C_3A 6.3 C_4AF	3. 11.0 C_3A 6.8 C_4AF	4. 14.0 C_3A 7.2 C_4AF
21 Days	5157	4456	5620	4520
28 Days	5984	5029	6239	5157
35 Days	6048	5857	6366	6239
42 Days	6119	5950	6494	6684

The other half of this series was taken at fourteen days from the 70 deg. water storage, subjected to 400 deg. F. for 24 hours, slowly cooled for 6 hours, then again stored in 70 deg. F. water in a closed container (to keep free of CO_2) for 6 days. On the 21st

TABLE C

Cement			21 Days			28 Days			35 Days			42 Days			
				400° F. Immersed	400° F. Immersed		400° F. Immersed	400° F. Immersed		400° F. Immersed	400° F. Immersed		400° F. Immersed	400° F. Immersed	
C_2F	C_3A	C_4AF	Normal	Water	Sulphate Solution	Normal	Water	Sulphate Solution	Normal	Water	Sulphate Solution	Normal	Water	Sulphate Solution	Surface Area
1.29	0.00	15.5	....	....	4106	5157	....	3820	....	....	3629	....	....	3590	1541
0.0	0.5	17.3	5157	4472	4791	5984	4520	4982	6048	4202	4456	6119	4393	4456	1820
0.0	3.0	11.9	....	....	4393	....	....	3728	....	....	3692	....	....	3374	2080
0.0	5.0	12.0	....	....	4138	5730	....	4138	....	....	3510	....	....	3374	1541
0.0	8.0	6.3	4456	4202	4202	5029	4202	1400	5857	4290	732	5950	4202	Failed	1490
0.0	11.0	6.8	5602	4800	4647	6239	4175	509	6366	3438	Failed	6494	3055	Failed	1640
0.0	11.4	9.0	5220	4647	2865	5220	3629	985	5475	4042	Failed	5515	3400	Failed	1665
0.0	14.0	7.2	4520	4074	3947	5157	4101	955	6239	4202	Failed	6684	3947	Failed	1610

day two cylinders from each set were broken for compressive strength at this period. The remaining cylinders of the series were again subjected to the heating and curing cycle and two cylinders from each series broken at twenty-eight days; this was repeated for four cycles. The results are shown in Table B.

Test Results

These results were quite in accord with our expectations, inasmuch as the 400 deg. F. temperature when followed by the 6-day water immersion recovery period was not sufficient to cause either a serious loss or gain in compressive strength for the four cycles of treatment. We concluded then that the temperature 400 deg. F. as used, could not be considered for the purpose intended as destructive. True, it arrested the normal progressive compressive gain, but for the purpose of an accelerated test for sulphate resistance, this was desired as a means of obtaining increased absorption of the test specimen for accelerated reaction.

TABLE B

	1. 0.5 C_3A 17.3 C_4AF	2. 8.0 C_3A 6.3 C_4AF	3. 11.0 C_3A 6.8 C_4AF	4. 14.0 C_3A 7.2 C_4AF
21 Days	4472	4202	4800	4074
28 Days	4520	4202	4175	4101
35 Days	4202	4290	3438	4202
42 Days	4393	4202	3055	3947

This was considered sufficient data to carry on an experiment using this method to determine if any acceleration in deterioration due to aggressive solution could be quantitively measured.

The cements used in the preliminary trial were again made for the sulphate resistance experiment together with four additional cements. The specimens were 2 by 4 cylinders, one to three mortars of a 0.9 W/C. Cylinders were capped just prior to test. All cylinders were stored in sealed cans to prevent any action from CO_2. The aggressive solution used was a 5% solution of sodium sulphate. The testing procedure with regard to the heating and curing cycle was the same as previously outlined with the exception that the curing medium was a 5% sulphate solution instead of water.

The results are shown in Table C.

It will be noted in Table C that we have included compressive strengths under normal 70 deg. F. water curing conditions as additional information concerning the strength quality. The sulphate resistance of the cements is indicated by the strength differential between the 400 deg. F. heated and water immersion cylinders and the 400 deg. F. heated and sulphate solution immersion cylinders.

The results in Table C show a good indicative value at 28 days of what may be expected at the later periods. The method is intended to show any influence that may affect the sulphate resistance of a cement such as composition, surface area, manufacturing methods, etc.

These cements were obtained on the open market with the exception of cement No. 1, Table C. This cement was made experimentally in our laboratory.

Since these cements were obtained on the open market we know nothing concerning the details of their manufacture, and for this reason the indicated relation between C_3A and sulphate resistance in Table C may not be in agreement with other cements having a like composition.

To show a comparison between the length of time necessary to determine failure for a poor sulphate resistant cement by the cold method as against the accelerated method, the following table shows:

C_3A 14.0% cured seven days in fog room, stored in 5% solution (Sodium Sulphate at 70 deg. sulphate solution renewed weekly. Failure noted after 70 days' storage in the sulphate solution.

C_3A 14.0% by the accelerated method showed indication of failure at 28 days' elapsed time and complete failure at the end of 35 days.

Other comparisons show a wider time period.

Previously we made mention of the fact that the test specimens were protected from the action of CO_2 during immersion by placing them in sealed cans. A number of authorities have mentioned that the sulphate resistance of concrete specimens was greatly increased if the surface of the specimen was acted upon by CO_2. To verify this detail we carried on the following test:

Effect of CO_2

Using the same four cements as in the preliminary test and making up to the same mortar design in 2 by 4 cylinders, we followed the same test procedure, with the following modification. After the test specimen had been heated to 400 deg. F. for 24 hours and allowed to cool slowly, they were placed in a moist CO_2 saturated atmosphere for 24 hours after which it was placed in the 5% sodium sulphate solution for 6 days. Two specimens were then broken for compressive strength and the remaining specimens were again subjected to the cycle of heating, cooling, CO_2 impregnation and sulphate solution immersion for the remaining successive test periods, with the results shown in Table D.

From these results we must agree that the action of CO_2 is decidedly beneficial and the precaution to protect the test specimens during the accelerated test is well justified when comparative resistance is to be determined.

The results obtained were decidedly satisfactory for our purpose as manufacturers, to show in a minimum of time the sulphate resistance of a cement under observation. In these tests the sulphate resistance properties were quantitively measured by comparing them with two cements of proved resistance. The second cement listed in Table C having a C_3A value of 0.5% and a C_4AF value of 17.3% had previously been reported upon by two qualified sources as having maximum performance. The seventh cement listed in Table C having a C_3A value of 11.4%, and a C_4AF value of 9.0% was sent us together with the report showing it to be

TABLE D

Cement		21 Days			28 Days			35 Days			42 Days		
			400° F.	400° F. CO_2		400° F.	400° F. CO_2		400° F.	400° F. CO_2		400° F.	400° F. CO_2
C_3A	C_4AF	Normal	Sulphate	Sulphate	Normal	Sulphate	Sulphate	Normal	Sulphate	Sulphate	Normal	Sulphate	Sulphate
0.5	17.3	5157	4791	5457	5984	4982	5220	6048	4456	4610	6119	4456	5093
8.0	6.3	4456	4202	4202	5029	1400	4010	5857	732	2082	5950	Failed	1082
11.0	6.8	5602	4647	5060	6239	509	3977	6366	Failed	2228	6494	Failed	2292
14.0	7.2	4520	3947	4010	5157	955	3947	6239	Failed	1019	6684	Failed	Failed

a very poor sulphate resistance cement. Then by accepting cement No. 2 (Table C) as representing the maximum and No. 7 (Table C) in the class of undesirable performance, it was easy to evaluate performance for cements subject to the test.

The calculated potential composition may at best be only indicative of a cement's performance under sulphate attack, and methods of manufacture may so vary this performance that the true value can be arrived at only by actual test.

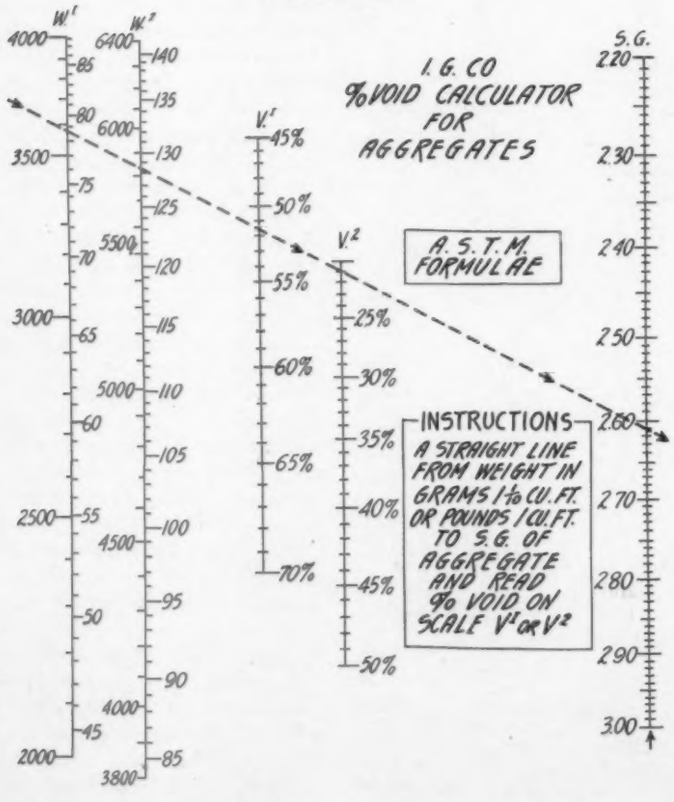
The tests as above outlined include many details that have since been dispensed with. These details were carried out in the above tests to measure, by compressive strengths, the sulphate resistance of a portland cement. For manufacturing routine we now use test specimens in the form of a disc 1½ in. by ¾ in. They are made to the same mortar design and subjected to the same test procedure, with the exception of the compressive strength test, visual examination being deemed sufficient for classification.

The purpose of the test is to simulate, to a greatly exaggerated degree, field conditions as affected by seasonal and climatic changes and to determine the comparative resistance values of various cements under these conditions.

The 5% sodium sulphate solution was selected because it was found to be as rapid as a saturated solution. Solutions of weaker strength were much slower in their reaction, but in the end the results were on the same comparative basis.

Void Calculator for Aggregates

By C. E. Heinz,
Joplin, Mo.



A SIMPLE NOMOGRAPHIC CHART has been constructed to calculate the "void" content of aggregates. The chart had been constructed for the use of workmen in rock-crushing plants and has been found useful by others.

The chart is based upon the formulas approved by the A.S.T.M. and the American Association of State Highway Officials. The void content of aggregates calculated by these formulas depends upon two variables, the specific gravity of the mineral particles and the weight of the mass in a given volume. Knowing these two variables, the third is easily read from the chart by drawing a straight line through the two numbers known, by test, and reading the unknown figure on the scale where the line crosses. A black thread taut on the two known numbers or a straight line scratched on a piece of clear celluloid or a straight edge could be used to find the unknown.

The A.S.T.M., C-29-27, and Tentative method T-19 of the State Highway Officials, designate 1/10, ½ and 1 cu. ft. containers shall be used for this test and detail the procedure for filling, tamping and weighing the "rodded" aggregate under the standard conditions.

The chart simplifies the calculations for engineers, is an office tool for checking plant and laboratory reports and has proved of value to field and road testers. The principle advantage is the high speed calculation without error.

This chart shows on the left hand side of the left-hand scales the weight of 1/10 cu. ft. in the metric units of grams. The right-hand side of the scales read the equivalent weight of 1 cu. ft. of the material under these conditions. Should a 1 cu. ft. container be used in the test, the weight is reported in pounds and located on the scale. If a ½ cu. ft. measure is used, multiply the weight found by two and locate the weight per cubic foot on the scale. If it is necessary to use English weights for the 1/10 cu. ft. container, the chart figures 45 to 140 lb. are read 4.5 to 14.0 pounds by tenths and each "tenth" can be converted into ounces by calculation.

The scale marked "S. G." is calibrated from 2.20 to 3.00 specific gravities of minerals usually used for aggregates.

The spaced line across the chart illustrates the operation.

Assume that 1/10 cu. ft. weighs 3580 grams. Then 1 cu. ft. would weigh 78.6 lb. or ½ cu. ft. 39.3 lb. (Scale "W¹"); if the 1/10 cu. ft. measure was read in English weights, 7 lb. and 14 oz., or 7.86 lb. Now assume the specific gravity of the mineral to be 2.61. A straight line between these two known numbers and we read 51.7% voids on the "V¹" scale.

The reproduction of this chart is by kind permission of the Independent Gravel Co., Joplin, Mo., and was a part of a technical study of their processing plants.

To Rebuild Plant

Universal Atlas Cement Co., Chicago, Ill., according to an official announcement, will rehabilitate its Hudson, N. Y., plant and make this 100% electrically operated. The improvements include newest type stone crushing plant with capacity of 10 tons per minute; an electrically driven belt conveyor over half a mile long to transport stone from crusher to plant; new limestone storage with capacity of 25,000 tons; completely new grinding equipment for both raw materials and clinker; new Diesel electric locomotive for hauling loaded cars of cement from plant to railroad; installation of modern motor trucks to haul stone from quarry to crusher. These improvements are in addition to new concrete stock house built in 1933 and to new electric quarry shovels, drills and air compressors installed last year. Construction will start this summer.

New British Plant

Eastwoods, Ltd., London, England, with cement plants in Cambridge and Sussex, is building a new one in the north of England.

Industrial Sand Producers Form Independent Association

AT A MEETING of the industrial sand industry in Pittsburgh, Penn., April 8, the National Industrial Sand Association was formally organized. Since 1933 the industry organization has functioned as a division of the National Sand and Gravel Association.

A. Warsaw, Chicago, Ill., was elected president; R. G. Hay, Zanesville, Ohio, vice-president, L. M. Hansen, Chicago, treasurer. Besides these officers the following directors were elected: Geo. P. Allen, Toledo, Ohio; E. J. Beyer, Rockwood, Mich.; P. S. McDougall, Ottawa, Ill.; Mark T. McKee, Detroit, Mich.; A. J. Miller, New York City, and W. J. Woods, Lewistown, Penn. V. P. Ahearn, executive secretary of the National Sand and Gravel Association, was appointed executive secretary also of the National Industrial Sand Association, and Stanton Walker, director of engineering of both associations.

In an open letter to the industry Executive Secretary Ahearn said:

"In consideration of the matter of effective functioning of the Association, it was made evident at the Pittsburgh meeting that the industry as a whole is now fully aroused to the elemental necessity for organized research in behalf of the industrial sand industry. Heretofore there has been no instrument available to the industry for discussion and action upon the matter of intelligent research, and those in attendance at the Pittsburgh meeting were not unmindful of the fact that an industry which does not engage in research is subjecting itself to the danger of losing markets in which its materials have been employed. It is noteworthy in this regard that practically every industry is engaging itself in developing new uses for its products and in consolidating its position in fields which it already reaches. It is hardly an exaggeration of the circumstances to say that an industry not pursuing a definite program of research is ultimately doomed to stagnation and paralysis.

"The committee on nominations submitted the following names for the membership of the committee on research of the association, which received the approval of the meeting:

"T. C. Matthews, chairman, Pennsylvania Glass Sand Corp., Lewistown, Penn. (glass sand); J. A. Crew, the Ayers Mineral Company, Zanesville, O. (miscellaneous sands); A. N. Farmer, Sand Products Corp., Cleveland, O. (unbonded foundry sand); John P. Putnam, National Silica Co., Oregon, Ill. (ground sand); E. O. Schneider, Ottawa Silica Co., Ottawa, Ill. (blast sand); James H. Whitehead, Whitehead Brothers Co., New York City (bonded foundry sand)."

By using the offices and part time of the staff of the National Sand and Gravel Association the following modest dues for membership in the National Industrial Sand Association were made possible:

A. Warsaw

Annual tons		Annual dues	Monthly dues
0—	35,000	$ 25.00	$ 2.08
35,000—	50,000	35.00	2.92
50,000—	75,000	50.00	4.17
75,000—	100,000	75.00	6.25
100,000—	150,000	100.00	8.33
150,000—	200,000	150.00	12.50
200,000—	300,000	200.00	16.67
300,000—	400 000	250.00	20.83
400,000—	600,000	300.00	25.00
600,000—	800,000	325.00	27.08
800,000—	1,000,000	350.00	29.17

The new association participated in the recent National Conference on Silicosis (Rock Products, May, p. 42) and Executive Secretary Ahearn is chairman of the conference committee on regulatory and administrative phases of the silicosis problem. The National Industrial Sand Association is a member of the Air Hygiene Foundation, an organization which has already done a most effective job in developing complete information concerning the whole question of dust in industry.

Directors to Meet in St. Paul

National Sand and Gravel Association directors will hold their regular semi-annual board meeting at the St. Paul Hotel, St. Paul, Minn., July 9 and 10. Association committees on specific problems will be asked to meet with the board in order that there may be a general discussion.

Rail Shipments

Western Sand and Gravel Co., Spring Valley, Ill., recently made its first rail shipments, having operated a trucking plant exclusively. A new washing plant and storage bins were recently completed.

To Reorganize

Lincoln Sand & Gravel Co., Lincoln, Ill., has petitioned the federal district court at Springfield, Ill., for permission to reorganize under 77-B. Assets and liabilities are listed both at $284,579.07.

Moves Plant

Hallett Construction Co., Granite Falls, Minn., has moved its sand and gravel plant to two miles west of Granite on the Peterson farm. A royalty of 5c per cu. yd. will be paid.

Changes Name

Missouri-Illinois Material Co., St. Louis, Mo., is the new name of the former Alpha Sand Co., subsidiary of the Alpha Portland Cement Co., Easton, Penn.

Prices Bid—Contracts Let

Monmouth, Ill.: Bids on 50,000 cu. yd. of road gravel, spread on the highway, ranged from $1.73 to $1.83 per cu. yd. on one township highway, and $1.74½ to $1.92 on another. Plack Transfer Co., Peoria, Ill., was low bidder in one case, and T. O. Miles, Galesburg, Ill., in the other.

• • •

Dayton, Ohio: City purchased 200 tons of limestone dust from Piqua Stone Products Co., Piqua, Ohio, at $3.50 per ton; 200 tons of crushed gravel from Keystone Gravel Co., Dayton, at $1.30; 200 tons of crushed limestone from Laura Gravel and Stone Co., Phillipsburg, at $1.65.

• • •

Jasper, Mich.: The France Stone Co., Toledo, Ohio, has entered into a contract with the Lenawee county road commission to furnish crushed stone at 75c a ton in carload lots at the plant and 80c per ton in truckload lots, an advance of 5c a ton since last summer.

• • •

Grand Island, Neb.: State let contract for 3081 cu. yd. of highway gravel to be used locally to Third City Sand Co., Grand Island, at 67.7c per cu. yd. Six bids ranged to $1.07.

• • •

Nebraska City, Neb.: State let contract for 684 cu. yd. of highway gravel to be used locally to Arthur Eining, Nebraska City, at $1.56 per cu. yd. Three bids ranged to $1.83.

• • •

High Point, N. C.: City let contract for 556 tons of crushed stone to Raleigh Granite Co., Raleigh, at $2 per ton.

• • •

Toulon, Ill.: Contract let for graveling some 10 miles of West Jersey township roads to McGrath Sand and Gravel Co., Lincoln, Ill., at $1.47 per cu. yd. for washed aggregate spread.

• • •

Havana, Ill.: Contract let for 18,000 tons of highway gravel for Havana township to Springfield Sand and Gravel Co., Springfield, Ill., at 42c per ton, f.o.b. plant.

• • •

Youngstown, Ohio: Contract let to Standard Slag Co., Youngstown, for cold patch bituminous mix at $4.50 per ton, f.o.b. plant; granulated slag at $1 per ton, f.o.b. plant.

Hints and Helps for Superintendents

Putting Lubricant Into Damaged Nipples

By Ross Wheelton,
Aldershot, Ontario

OFTEN the nipples provided for grease lubrication on modern machines become damaged slightly, particularly if they are located in a place where they are subject to flying stones.

When the face of such a nipple is only slightly nicked a perfect seal is not obtained at the grease gun tip and the lubricant comes out at this point instead of being forced into the part requiring lubrication.

In such a case a new fitting should be put on, but one is not always available when required and consequently that part of the machine often goes without proper lubricant for some time. A good emergency method that is very satisfactory is to put a piece of cloth between the nipple and the grease gun and force the grease through the mesh of the cloth as shown in the illustration. The cloth forms a gasket around the damaged nipple and prevents the grease from exuding at this point, and it is instead forced into the required place. I have often used this method and find it so satisfactory that replacement of the nipple is at times delayed far longer than is necessary.

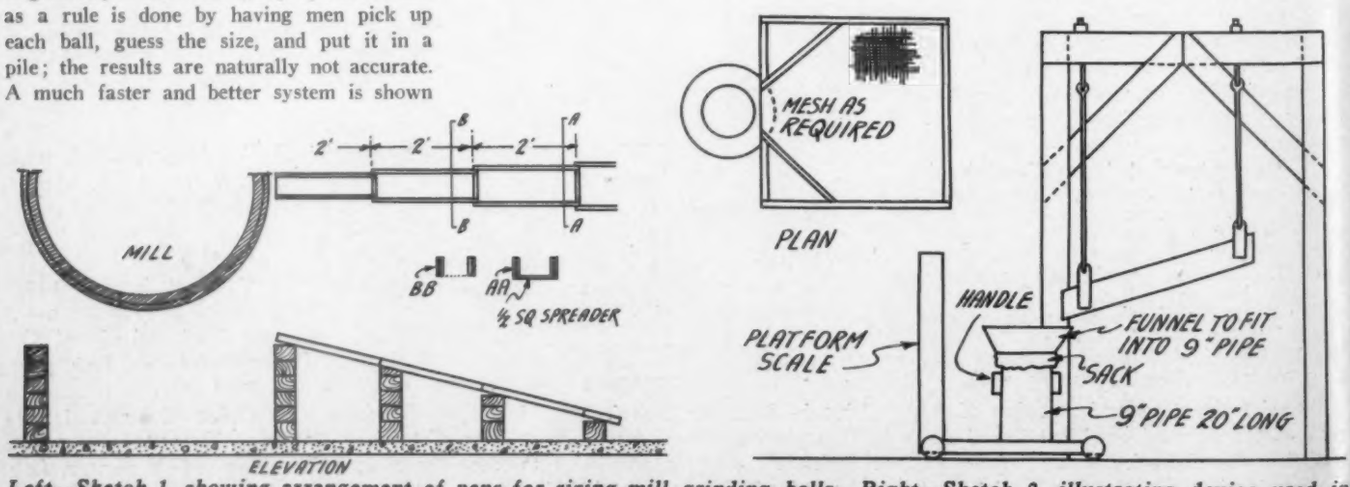
Emergency method for lubricating a damaged nipple

Culling and Sizing Ball Mill Load

By V. K. Newcomer,
Independence, Mo.

THE CULLING AND SIZING of the load dumped from a ball mill, or the first compartment of a combination mill, is generally a slow and costly operation, and as a rule is done by having men pick up each ball, guess the size, and put it in a pile; the results are naturally not accurate. A much faster and better system is shown in Sketch 1. One large pen, of any available material, such as ties, is built under the mill to hold the load as it falls; and as many smaller pens as gradations are wanted are built in the most favorable direction. A frame most easily made with the arc welder is set at an angle from the first pen. A set of openings is made to allow the various sizes of balls to pass, the smallest, of course, being at the high end. In use the balls are simply placed on the rails at the top and fall through at the predetermined dimension. This device will do more with two men than six men will in the same time by the other method.

Sketch 2 shows a device which is used successfully in culling and weighing small balls such as 7/8-in. A screen, the mesh determined by the size wanted, is suspended from a framework with loose rods or cables and is set at a slight angle. In use, the platform scale is set to whatever weight is wanted in the sack plus the tare of the 9-in. pipe and the sack; the sack is put down inside the pipe, open end up, and the funnel inserted, the balls are shoveled on to the

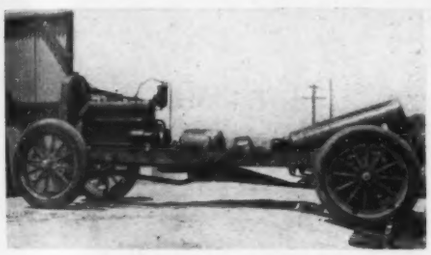


Left—Sketch 1, showing arrangement of pens for sizing mill grinding balls. Right—Sketch 2, illustrating device used in culling and weighing small balls

screen and the screen shaken once or twice by hand. When the scale balances, the funnel is removed and the pipe *lifted* off the sack. Do not try to pull the sack from the pipe. This seems wrong, but about two tries will prove it right. The culls fall in the clear and are easily shoveled up. This system is immeasurably faster than the usual system of throwing the balls on to a stationary screen and then shoveling them up a second time.

Portable Electric Welding Outfit

THE portable electric welding outfit shown in the photo was made at the plant of P. J. Weisel, Inc., silica sand producers, Corona, Calif. An old truck chassis was utilized. The motor of the truck was connected by a clutch to a d.-c. motor which had been used to drive an electric milk truck, and it makes a good generator for electric welding. The truck is not self-propelled, but is attached to a car whenever it has to be moved; and for short distances it can be pushed and dragged into place by hand. Tanks for oxy-acetylene welding are carried in a rack over the rear axle.



Old truck chassis carries welding outfit

Another Use for Old Oil Barrels

AN OLD OIL BARREL can be conveniently used to change the direction of discharge from a flume, as shown in the accompanying illustration of a chute delivering sand and water from the washing screen in a gravel plant. This picture, taken at the plant of the Edgerton Sand and Gravel Co., Edgerton, Wis., shows the upper chute emptying into the barrel and from that into the sand cone below. The use of the vertical drop through the barrel was necessary in this case because the chute passed over another chute just before discharging, hence was too high to discharge conveniently to the sand cone. The top of the barrel was completely cut away, and a hole was cut in one side, next to the bottom, to permit the discharge of the water and sand. Such an installation might be conveniently made in many gravel plants where a vertical drop of the sand and water or a change in the direction of the discharge is necessary.

Oil barrel changes direction of discharge from flume

Prevents Back Drag in Elevator

THERE is likely to be a considerable back drag on a bucket elevator when the machinery is stopped, which may result in the elevator turning backwards and spilling out any material which it may contain. To prevent this, a simple home-made ratchet is used on the largest bucket elevator at the Fontana, Wis., plant of the Moulding-Brownell Corp. This elevator carries all the material to the sizing screens at the top of the plant.

The drive for this elevator is through a large geared wheel on the same shaft as the head pulley. About 6 ft. behind this geared wheel there is a corner post of the plant structure. To this is attached, by a loose hinge made of an old piece of belting, a plank which is just long enough to reach the geared wheel near its top. The under side of the plank is fitted with an iron plate which serves as a wearing surface against which the gears of the wheel strike. As the gear wheel turns forward, the iron plate slides over the teeth; but when the elevator is stopped, and commences to turn backward, the end of the plate hits against a gear tooth and stops the motion immediately. Sometimes it is necessary to add a little weight to the plank to make sure that it always maintains a good contact with the gears.

Centrifugal Pumps Made Portable

By John F. Robertson,
Superintendent, Cedar Bluff Quarry, Princeton, Ky.

THE YEAR 1935 was very wet, causing us to be faced with several water pumping emergencies, which were aggravated by the depth of the quarry and our frequent "going down" operations. We have three Allis-Chalmers electric centrifugal pumps—a 2½ by 2-in. type S S for 100 g.p.m. at 30 ft. head, a 6 by 5-in. type S J for 600 g.p.m. at 200 ft. head, and a 3 by 2½-in. type H S for 300 g.p.m. at 200 ft. head. The last named was purchased in 1935.

They are all mounted on cut-down quarry cars and housed as shown in the accompanying illustrations. In case of emergency, as has happened twice this year, it is necessary only to cut the wires, remove the suction and discharge hoses, and hitch the incline cable to the pumps in order to get them away from rising water.

Our quarry, on only too frequent occasions, becomes as dry during dry weather, as it is wet during wet weather. At these times, the small Type S S pump is used to pump water from inaccessible places to the larger pumps. The water is then re-pumped to the large tanks serving the steam-shovels and other machinery.

Pumps mounted on cut-down quarry cars are easily moved

RECENT QUOTATIONS ON ROCK PRODUCTS SECURITIES

Stock	Date	Bid	Asked	
Allentown P. C., com.[47]	5-28-36	4	5	
Allentown P. C., pfd.[47]	5-28-36	6	7	
Alpha P. C., com.	5-29-36	23½	24	
American Aggregates, com.[48]	5-14-36	1	2	
American Aggregates, pfd.[48]	5-14-36	4	6	
American Aggregates, 6's 1st mtg. 3/6's, 1943, new bonds[48]	5-14-36	52	....	
American Aggregates, 6's, 1943, old bonds[48]	5-14-36	52	....	
Arundel Corp., com.	5-29-36	17	actual sale	
Ashgrove L. & P. C., com.[47]	5-28-36	12	15	
Ashgrove L. & P. C., pfd.[47]	5-28-36	90	100	
Bessemer L. & C., Class A[47]	5-28-36	5	6	
Bessemer L. & C., 1st 6½'s, 1947[48]	5-14-36	75	79	
Bessemer L. & C., cert. of dep., 1947[48]	5-15-36	76	....	
Boston S. & G., com.[37]	5-14-36	1	2	
Boston S. & G., new 7% pfd.[37]	5-14-36	8	10	
Boston S. & G., 7's, 1939[37]	5-14-36	70	....	
Calaveras Cement, com.[40]	5-11-36	5	5¾	
Calaveras Cement, 7% pfd.[40]	5-11-36	79	83	1.00 (ac.) July 1
California Art Tile, A[9]	5-16-36	12	13	.25 (ac.) June 1
California Art Tile, B[9]	5-14-36	2½	3	
Canada Cement, com[42]	5-19-36	6⅝	6⅞	
Canada Cement, pfd.[42]	5-19-36	65¼	66	
Canada Cement, 5½'s, 1947[42]	5-19-36	106	106¾	
Canada Crushed Stone, 6½'s, 1944[42]	5-19-36	92	....	
Certainteed Products, com.	5-28-36	12½	actual sale	
Certainteed Products, pfd.	5-28-36	98	actual sale	
Certainteed Products, 5½'s, A, 1948	5-29-36	92⅞	actual sale	
Consol. Cement, 1st 6's, 1950[47]	5-28-36	79	80	
Consol. Cement, A[47]	5-28-36	4	5	
Consol. Okla. S. & G., 6½'s, 1948[42]	5-19-36	12	20	
Consol. Rock Products, units[47]	5-28-36	¼	½	
Construction Mat., com.[47]	5-28-36	10c	15c	
Construction Mat., pfd.[47]	5-28-36	¼	½	
Consumers Rock & Gravel, 1st mtg. 6½'s, 1948[47]	5-28-36	20	22	
Coosa P. C., 1st 6's[47]	5-28-36	35	50	
Coplay Cement Mfg., pfd.[47]	5-28-36	12	13	
Coplay Cement Mfg., 6's, 1941[47]	5-28-36	75	80	
Cumberland P. C., 7's, 1937[47]	5-28-36	85	90	
Dewey P. C., com.[47]	5-28-36	45	50	
Dolese & Shepard[47]	6- 1-36	34	36	
Dufferin Pav. & Cr. Stone, pfd.[42]	5-19-36	55	60	
Federal P. C., 6½'s, 1941[47]	5-28-36	42	45	
Fla. P. C., 6½'s, 1937[48]	5-15-36	100	102	
Fla. P. C., units[47]	5-28-36	18	20	
Giant P. C., com.[47]	5-28-36	3	5	
Giant P. C., pfd.[47]	5-28-36	15	17	
Gyp., Lime & Alabastine, Ltd.	5-29-36	5⅞	actual sale	
Gyp., Lime & Alabastine, 5½'s, 1948[47]	5-28-36	96	98	
Hawkeye P. C., cap.[47]	5-28-36	31	35	
Hercules Cement, com.[47]	5-28-36	30	35	
Hercules Cement, pfd.[47]	5-28-36	90	100	
Hermitage Cement, com.[47]	5-28-36	16	20	
Hermitage Cement, pfd.[47]	5-28-36	92	95	
Ideal Cement, com.	5-29-36	65	68	
International Cement, com.	5-28-36	47⅛	actual sale	.37½ (qu.) June 30
International Cement, conv. deb. 4's, 1945	5-29-36	134	actual sale	
Kelley Island L. & T.	5-28-36	20½	21	
Ky. Cons. Stone, 6½'s, 1938[47]	5-28-36	16	20	
Ky. Cons. Stone, com.[47]	5-28-36	1	2	
Ky. Cons. Stone, pfd.[47]	5-28-36	3	5	
Ky. Cons. Stone, 1st mtg. 6½'s[48]	5-15-36	20	25	
Ky. Rock Asphalt, 6½'s[47]	5-28-36	20	25	
Lawrence P. C., com.	5-27-36	16	18	
Lawrence P. C., 5½'s, 1942[47]	5-28-36	98	99	
Lehigh P. C., com.	5-29-36	18¼	19	
Lehigh P. C., 4% pfd.	5-29-36	95½	97	1.00 (init.) July 1
Louisville Cement[47]	5-28-36	99	....	
Lyman-Richey 1st 6's, 1935[47]	5-28-36	15	20	
Marbelite Corp., com. (cement pts.)[40]	5-11-36	20c	40c	
Marbelite Corp., pfd.[40]	5-11-36	3¾	4½	
Marblehead Lime, 7's, 1944[16]	5-14-36	95	96	
Marquette Cement, com.[47]	5-28-36	28	30	
Marquette Cement, pfd.[47]	5-28-36	95	100	
Material Service Corp.[47]	5-28-36	6	8	
McCrady-Rodgers, com.[47]	5-28-36	5	6	
McCrady-Rodgers, 7% pfd.[47]	5-28-36	25	35	
Medusa P. C., com.[47]	5-28-36	16	17	
Medusa P. C., pfd.[47]	5-28-36	40	45	
Michigan L. and C., com.[47]	5-28-36	50	55	
Minnesota Mining & Mfg. Co.	5-28-36	29	actual sale	
Missouri P. C.	5-29-36	10½	10¾	
Monarch Cement, com.[47]	5-28-36	97	100	
Monolith P. C., com.[9]	5-16-36	3½	5¼	
Monolith P. C., 8% pfd.[9]	5-16-36	6½	7	.25 (ac.) May 9
Monolith P. C., units[9]	5-15-36	16½	17¾	
Monolith P. C., 1st mtg., 6's[9]	5-15-36	102	104	
Monolith Portland Midwest, pfd.[9]	5-16-36	2	2½	
National Gypsum, A, com[47]	5-28-36	57	58	
National Gypsum, 1st pfd.[47]	6- 1-36	103	104	1.75 (qu.) July 1
National Gypsum, 2nd pfd.[47]	6- 1-36	15	16	.25 (qu.) July 1
National Gypsum, 6's[47]	5-28-36	105	106	
National L. & S., 6½'s, 1941[47]	5-28-36	90	100	
Nazareth Cement, com.[47]	5-28-36	7	8	
Nazareth Cement, pfd.[47]	5-28-36	55	60	
Newaygo P. C., 7% cum. pfd.[47]	5-28-36	40	50	
New England Lime, units[14]	5-14-36	8	....	
N. Y. Trap Rock, 1st 6's, 1946	5-29-36	....	81	
N. Y. Trap Rock, 6's, stamped, 1946	5-29-36	80	80⅝	
N. Y. Trap Rock, 7% pfd.[40]	5-15-36	60	65	
North Amer. Cement, 1st 6½'s, 1953[47]	5-28-36	37	38	
North Amer. Cement, 6½'s, 1943[47]	5-28-36	93	94	
North Amer. Cement, 6½'s, 1940[47]	5-28-36	65	67	
North Amer. Cement pfd., "A"[47]	5-28-36	2	3	
North Amer. Cement, "B"[47]	5-28-36	5	6	
North Shore Mat. 1st 6's[47]	5-28-36	40	45	
Northwestern P. C., units[9]	5-15-36	53	....	
Northwestern States P. C.[47]	5-28-36	23	25	
Ohio River S. & G., com.	5-28-36	1	....	
Ohio River S. & G., 1st pfd.	5-28-36	60	....	
Ohio River S. & G., 2nd pfd.	5-28-36	4	....	
Ohio River S. & G., 6's[48]	5-15-36	8	12	
Oregon P. C., com.[47]	5-28-36	3	4	
Oregon P. C., pfd.[47]	5-28-36	75	80	
Oregon P. C., conv. pfd.[47]	5-28-36	30	35	
Pacific Coast Agg., new com.[40]	5-11-36	2¾	3⅛	
Pacific P. C., com.[40]	5-11-36	3	4	
Pacific P. C., pfd.[40]	5-11-36	42	45	
Peerless Cement, com.[47]	5-28-36	¾	1	
Peerless Cement, pfd.[47]	5-28-36	1	2	
Penn.-Dixie Cement, com.	5-28-36	6⅝	actual sale	
Penn.-Dixie Cement, pfd. A	5-28-36	35	actual sale	
Penn.-Dixie Cement, 6's A, 1941	5-29-36	95	actual sale	
Penn. Glass Sand Corp., com.[47]	5-28-36	19	20	
Penn. Glass Sand Corp., pfd.[47]	5-28-36	113	115	1.75 (qu.) July 1
Penn. Glass Sand Corp., 6's[47]	5-28-36	103	105	
Petoskey P. C., 6's, 1941[48]	5-14-36	90	....	
Petoskey P. C., 6's, 1935-38[48]	5-14-36	95	....	
Petoskey P. C., com.[48]	5-14-36	3	....	
Republic P. C., 6's, 1943[47]	5-28-36	97	100	
Riverside P. C., A[9]	5-15-36	10	12½	
Riverside P. C., B[9]	5-15-36	1¾	2½	
Riverside P. C., pfd.[9]	5-15-36	98	100	
Rockland & Rockport Lime, com.	4-29-36	1¼	actual sale*	
Rockland & Rockport Lime, 6's, 1955, reg.	5-20-36	17%†		
Rockland & Rockport Lime, 1st pfd.[47]	5-28-36	4	6	
Santa Cruz P. C., com.[9]	5-15-36	42	45	
Schumacher Wallboard, com.[9]	5-15-36	4	5¾	
Schumacher Wallboard, pfd.[9]	5-15-36	18	18½	
Signal Mt. P. C., units[47]	5-28-36	45	47	
Southwestern P. C., units[40]	5-11-36	200	....	
Spokane P. C., units[47]	5-28-36	10	12	
Standard Pav. & Mat. (Can.), com.[42]	5-19-36	2½	3	
Standard Pav. & Mat., pfd.[42]	5-19-36	18	25	
Superior P. C., A[40]	5-11-36	39	41	
Superior P. C., B[40]	5-11-36	10½	11½	
Trinity P. C., units[47]	5-28-36	23	25	
U. S. Gypsum, com.	5-29-36	92⅞	actual sale	.50 (qu.) July 1
U. S. Gypsum, pfd.	5-29-36	161¼	164¾	1.75 (qu.) July 1
Volunteer P. C., 1st 7's, 1942[47]	5-28-36	97	100	
Volunteer P. C., units[47]	5-28-36	3	5	
Vulcanite P. C., com.[47]	5-28-36	6	7	
Vulcanite P. C., 7½'s, 1943[47]	5-28-36	97	100	
Wabash P. C.[47]	5-28-36	8	10	
Warner Co., ww. 1st 6's, 1944[47]	5-28-36	75	77	
Warner Co., com[47]	5-28-36	4	5	
Warner Co., pfd.[47]	5-28-36	13	15	
Whitehall Cement Mfg. com.[47]	5-28-36	40	44	
Whitehall Cement Mfg., pfd.[47]	5-28-36	47	50	
Wisconsin L. & C., 1st 6's, 1940[47]	5-28-36	75	80	
Wolverine P. C., com.[47]	5-28-36	5	6	
Yosemite P. C., A com.[40]	5-11-36	4½	5	

Quotations by: [9]A. E. White Co., San Francisco, Calif. [14]The Securities Co. of Milwaukee, Inc., Milwaukee, Wis. [37]Wise, Hobbs & Seaver, Inc., Boston. [40]Martin Judge, Jr., and Co., San Francisco, Calif. [42]Nesbitt, Thomson & Co., Toronto. [48]First National Bank of Chicago, Chicago, Ill. [47]Anderson Plotz and Co., Chicago, Ill. [48]Hewitt, Ladin & Co., New York, N. Y.

*20 shares sold at auction at Boston, Mass.

†$2000 bonds sold at Boston, Mass., at 17%.

Recent Dividends Announced

Calaveras Cement, 7% pfd. (accum.) (This leaves arrearage of $9.75 a share.)	$1.00	July	1, 1936
California Art Tile. A (accum.)	.25	June	1, 1936
Int. Cement (quar.)	.37½	June	30, 1936
Lehigh P. C., 4% pfd. (initial)	1.00	July	1, 1936
Nat. Gypsum, 1st pfd. (quar.)	1.75	July	1, 1936
Nat. Gypsum, 2nd pfd. (quar.)	.25	July	1, 1936
Penn. Glass Sand, pfd. (quar.)	1.75	July	1, 1936
U. S. Gypsum, com. (quar.)	.50	July	1, 1936
U. S. Gypsum, pfd. (quar.)	1.75	July	1, 1936

Riverside Cement Co., Los Angeles, Calif., reported for the year ended December 31, 1935, a net profit of $193,890 after depreciation and depletion, equal to $4.28 a share on 45,281 shares of $6 cumulative first preferred stock, the average number of shares on which dividends were paid during the year. This compares with net profit of $505,149 for the year 1934, equal, after first preferred dividend requirements, to 91 cents a share on 240,000 shares of class A stock. No provision for federal income tax was made for 1935 as company states that allowable deductions will substantially equal taxable income for the year.

Tonnage and selling prices were considerably lower during the year just ended than in 1934. Southern California cement prices started declining in March, 1935, and continued through October, carrying prices to levels lower than those reached in the price decline of 1930. There was a partial recovery in November and December but at the year-end prices were still 10% below a year previous.

Provision for depreciation and depletion charged to 1935 income amounted to $295,601 as compared with $378,255 for 1934. As the same per ton rates were used in calculation of these charges in both years, it is indicated that production for 1935 was 78% of that in 1934.

In addition, $112,224 was appropriated from capital surplus as a special provision for depreciation of the company's Oro Grande plant which was again idle throughout the year.

Expenditures on capital improvements in 1935 included approximately $150,000 on new equipment at the Crestmore plant, not all of which was installed at the end of the year. An additional expenditure of $67,000 will be required during the first quarter of this year to complete the installation.

Current and working assets (more than half of which was in cash) amounted to $1,966,529 at December 31, 1935, and current liabilities were $179,653.

Last year the company retired 2795 shares of its preferred stock, leaving 47,801 shares outstanding, of which 2786 shares were purchased for account of the company for future retirement.

In his first statement to stockholders as president of the company, Garner A. Beckett said: "Your directors desire to restate the principles which have guided them in the conduct of the company's affairs during the depression and which will continue to guide them in the future. Briefly these principles are: The payment of a just and living wage to employes; the rigid control to the minimum of all other expenditures; the unremitting practice of research for the discovery of improved products; the constant improvement of equipment and personnel; the maintenance of a sound financial position, and the payment of dividends, carefully measured by the company's earnings and prospects."

During the year 1935, there was added to capital surplus $297,500 which was transferred from capital stock account in respect of 2795 shares first preferred stock retired during the year, and $4891 which was the increase on disposal of certain investments that had previously been written down by charge to capital surplus. Deductions from capital surplus were: $112,224 as provision for 1935 depreciation on Oro Grande plant; and $271,686, the amount of dividends paid during the year on first preferred stock. This latter charge is authorized by the company's charter.

Dividends paid in 1935 on the class A stock amounted to $47,838. As of December 31, 1935, accruals on this stock amounted to $4.80 a share.

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Kelley Island Lime and Transport Co., Cleveland, Ohio, reports for the years ended December 31:

	1935	1934
Operating income	$701,420	$511,129
Depreciation and depletion	145,486	122,491
Operating profit	555,934	388,638
Selling, general, etc., expenses	207,153	206,815
Net operating profit	348,781	181 823
Other income (net)	23,307	52,750
Total income	372,089	234,573
Federal taxes	44.390	.....
Net profit	327 699	234.573
Dividends	216,266	185.371
Surplus for year	111,433	49.202
Earned per share	$1.06	$0.76

Note: No provision has been made in above statement for net operating loss of unconsolidated subsidiaries applicable to parent company's investment for year ended Dec. 31: 1935, $32,513; 1934, $21,264.

The balance sheet of the report also showed assets December 31, 1935, totaled $9,072,950.87, of which $1,615,064.51 represented current assets, including $477,352.14 cash on hand and $437,017.56 in government securities.

Current liabilities were listed at $208,769 08 with surplus figured at $927,863.81.

Commenting on his financial report, President G. J. Whelan said in part:

"Since the date of organization our country has passed through six economic disturbances of major import as well as many shorter ones, but the depression from which we are now emerging has been of greater intensity and length than anything previously experienced. It has exacted its toll from most individuals and organizations, and while we have not come through it unscathed, our record of having only one year in which an actual loss was sustained, and the fact that we have been able to continue our operations without the necessity of borrowing or seeking assistance from the shareholders is gratifying. Our financial condition remains very good and we are again beginning to add something to our surplus as a safeguard against future economic disturbances.

"In the first year of the company's operations, no dividends were paid to the shareholders, nor was anything paid in the fourth year, but since then no year has passed when the shareholders have not received a return on their investment with the exception of the year 1933 when dividends were suspended on account of the great uncertainties then existing. Quarterly payments were resumed at the rate of fifteen cents per share in 1934, continuing until October, 1935, when the payment of twenty cents per share was made and similar dividends have been paid quarterly since. With the resumption of more nearly normal business activity which has been moderately rising since 1933, we hope the results will justify a further increase in the rate of return to our shareholders before the end of 1936.

* * * * * * * * *

"Considerable publicity has been given to pre-fabricated homes that use no plaster or mortar, but careful analysis indicates that the American people will not easily relinquish their desire for individuality in their homes. There may be a field for moderate numbers of such ready made houses but we are firmly convinced that our generation will not see them displace the type of homes in which our materials are used. There is now a marked interest on the part of architects, builders and public officials in the use of more lime in building construction, because of the many advantages it has over other materials and we fully expect to benefit from this change."

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Cumberland Portland Cement Co., Cowan, Tenn., reports for the year ended December 31, 1935, a net profit of $39,472, equal to $2.89 per share on 13,641 preferred shares.

◆ ◆ ◆

Petoskey Portland Cement Co., Petoskey, Mich., reports for the years ended December 31:

	1935	1934
Sales	$996.337	$1,167,736
Net income	(d)35,930	109,639
Earned per share	(d) .18	$0.55

Number of shares, 199,165.

◆ ◆ ◆

Republic Portland Cement Co., San Antonio, Tex., reports for the year ended December 31, 1935, a net profit of $55,677, equal to $5.11 on its 7% preferred shares. Preferred dividends were in arrears $139,755 on December 31, 1935; funded debt was reduced during the year from $915,500 to $810,500; current assets were $470,805 (cash, $279,411), and current liabilities, $59,817. A plan has been submitted to stockholders for clearing up the preferred dividend arrears.

PWA Needs Money

SECRETARY OF INTERIOR ICKES said recently he believes the Government would be subject to damage suits by contractors on the Grand Coulee dam project in Washington if Congress does not appropriate funds to continue the $63,000,000 work. Secretary Ickes was supported by Edward Foley, chief counsel of the PWA, who advised Mr. Ickes that the Government might be subject to heavy damages on public works projects where contracts have been let if Congress does not provide funds for their continuation. An appropriation of $20,000,000 requested by the Interior Department for continuation of Grand Coulee has been rejected by the House of Representatives.

Secretary Ickes has reported that it would be possible for PWA to complete works projects costing $800,000,000 within a year if the federal law governing use of the PWA revolving fund is changed.

The revolving fund now permits only loans and it would be necessary to amend the act to allow direct grants from the RFC allocation of $250,000,000 for the fund. If this were done, Mr. Ickes said 3,428 projects which have been examined and approved by PWA could be completed in a year. The projects would require total grants of $350,000,000 which would necessitate an addition of at least $100,000,000 to the revolving fund.

Labor Union Row Continues

ST. LOUIS, MO.: The first complete industrial union to be organized here, composed of sand, gravel and crushed stone workers serving the St. Louis market, has been chartered in the Quarry Workers' International of North America, affiliated with the American Federation of Labor. About 1000 men employed by 20 producers and 25 material dealers in St. Louis and St. Louis county are members.

This is one of the type of unions advocated and promoted by John L. Lewis, head of the United Mine Workers of America, and includes about 30 different classifications of labor. Much the same group had been organized as an independent local, and recognition had been refused by various A. F. of L. building craft unions, which led to refusal to handle aggregates on building jobs (ROCK PRODUCTS, April, 1936, p. 42). Notwithstanding the fact that the new union is affiliated with A. F. of L., the local craft unions insist they will not handle materials produced by employers of the new union labor.

April Statistics

THE PORTLAND CEMENT INDUSTRY in April produced 8,519,000 bbl., shipped 9,089,000, and had in stock at the end of the month 20,556,000. Production and shipments in April showed increases, respectively, of 38.8 and 46.6%, as compared with April, 1935. Stocks were 3.1% lower than a year ago.

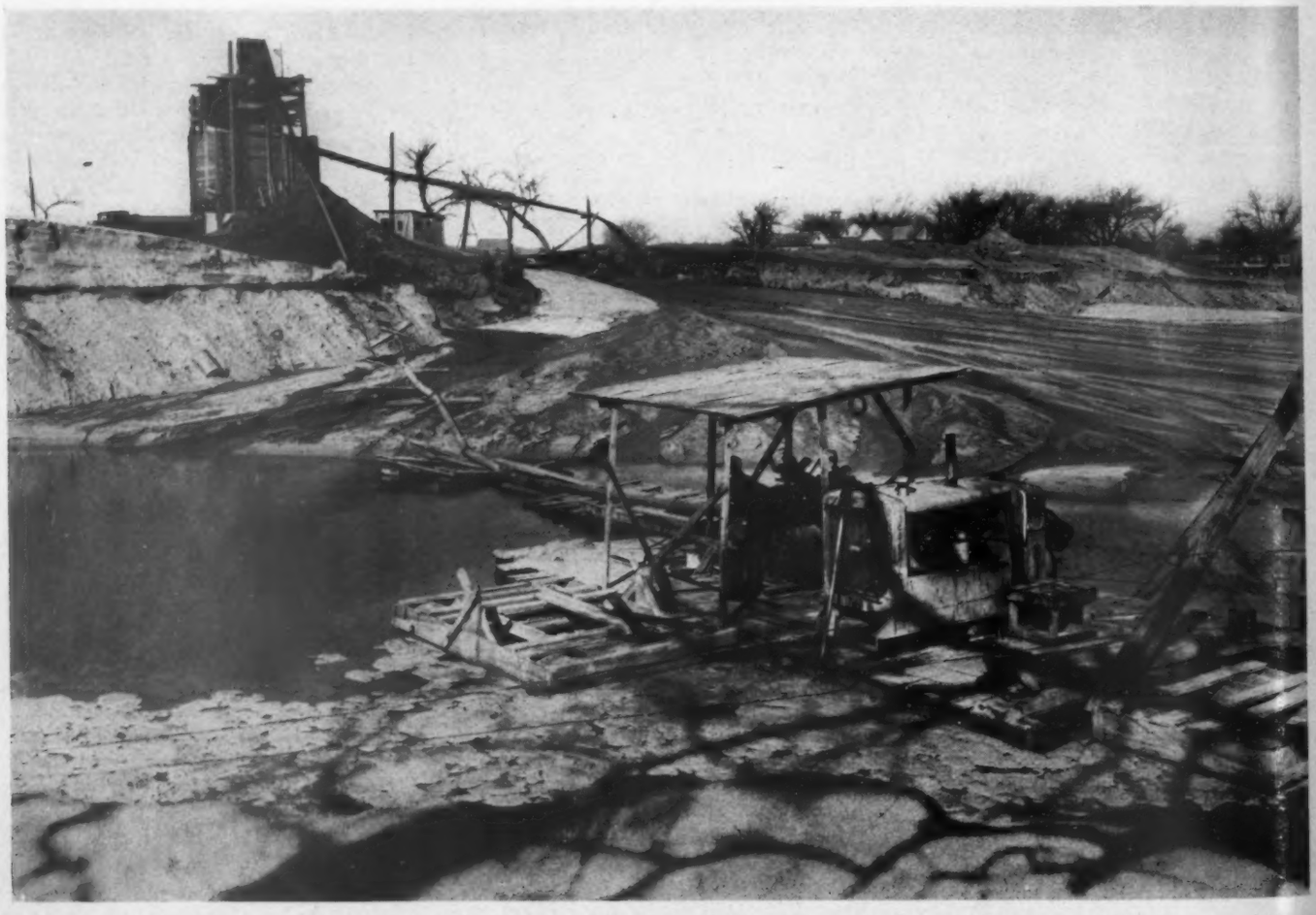
The statistics here given are compiled from reports received by the Bureau of Mines, from all manufacturing plants except one.

The mill value of the shipments—14,183,000 bbl.—in the first quarter of 1936, is estimated at $21,695,000. According to the reports of producers the shipments totals for the quarter include approximately 461 000 bbl. of high-early-strength portland cement with an estimated mill value of $870,000.

In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 162 plants at the close of April, 1935, and of 160 plants at the close of April, 1936.

RATIO (PERCENT) OF PRODUCTION TO CAPACITY

	April 1935	April 1936	Mar. 1936	Feb. 1936	Jan. 1936
The month	27.9	39.2	23.4	16.4	16.1
The 12 months ended	27.9	30.5	29.6	29.2	29.0



Sand and gravel pumping plant reduced to barest essentials—gasoline engine driving a 6-in. pump, delivering to a shore screening and washing plant; capacity 225 cu. yd. per day: L. C. Hause Sand and Gravel Co., Sedgwick, Kan.

Truck body with special dumping spout used for handling sand and gravel from pit to plant on West Coast construction

British Cement Manufacturers Visit United States

A DELEGATION of British portland cement manufacturers attended the May meeting of the Portland Cement Association in New York City, and subsequently inspected concrete highways in Michigan and Illinois. Included in the group were Lord Wolmer, chairman of the Cement Makers' Federation, president of the Cement and Concrete Association; Major R. A. B. Smith, Harold M. D. Anderson, Albert Y. Gowen and Halford W. U. Reddish. Mr. Gowen, head of Alpha Cement, Ltd., London, is a former vice-president of the Lehigh Portland Cement Co.

Two New Cement Plants

Ireland is currently reported to be building two new cement plants. Hitherto that country has depended on Belgian imports. American cement manufacturers fear this development will divert more Belgian cement to the United States.

Fire Loss

Michigan Limestone and Chemical Co., Buffalo, N. Y., agricultural limestone grinding plant was badly damaged by fire April 21. Loss was estimated at $75,000. The plant is being rebuilt immediately.

Expands Product Line

Sidwell Brothers, Somerset, Ohio, in addition to producing agricultural limestone, is now making crushed stone for highway improvement.

Beg Your Pardon!

In re-writing the headline of the article on page 64 of the April issue of ROCK PRODUCTS, the name of the author was inadvertently omitted. L. D. Carlyon, mechanical engineer of Bailey Meter Co., Cleveland, Ohio, is the author of "Three Things to Watch in Your Rotary Cement Kiln if You Want Satisfactory Combustion Control."

Plan Municipal Plant

Leominster, Mass.: Harold W. Burdett, mayor, is said to be planning development of a municipal quarry and construction of a crushing plant to supply city street requirements.

Will Double Capacity

Thomas & Brown Lime Co., Pueblo, Colo., is reported to have purchased the Western Lime Co. plant near Manitou, which it has operated the last year and a half. The plant is being modernized and enlarged to produce 1000 tons of lime per month. J. A. Brown is president and the sole owner of the company.

New Operation

Southwest Construction Co., Red Oak, Ia., has opened a new sand and gravel pit and built a permanent plant in Page county on the John Money farm; 500,000 cu. yd. of material suitable for concrete aggregates is said to be available.

Stirring Up New Competition

Tulsa, Okla., chamber of commerce is reported trying to stimulate the Mid-Continent Cement Corp., St. Louis, Mo., to continue promotion of a cement plant, for which the company spent $100,000 acquiring real estate in 1931.

Agitating State Cement Plant

Oklahoma newspapers are again filled with news items agitating construction of a state-owned and convict-operated cement plant.

Photo by Orville Logan Snider

Concrete pipe sections, weighing 44 tons each, 12-ft. inside diameter, made at plant of American Concrete and Steel Co. for Colorado River aqueduct in southern California, transported by truck and trailer powered by Diesel engine

Lime Producers' Forum

Conducted by Victor J. Azbe,
Consulting Engineer, St. Louis, Mo.

Determining Kiln Waste Gas Temperature and Stack Heat Loss on Rotary and Vertical Lime Kilns

TO KNOW heat loss from the top of vertical kilns under different conditions of operation and at different times of the day would be interesting and valuable and, to many, no doubt, surprising. But to determine this, one needs to have the gas analyzed, and must also know gas temperature. To obtain these temperatures is not a simple matter. On plain, open-top kilns, they cannot be obtained at all. On kilns with closed tops and equipped with either stack or fan, temperatures can be obtained, but ordinarily they do not mean anything, as the gases are diluted with the air rushing in through the charging door.

About the same condition exists on rotary kilns. The rear seal ring is always leaking, and in some cases immense quantities of air rush in here, as well as at other points of the dust chamber. The pyrometer shows temperatures; but what it shows may be half or less of the true temperature of the gases tumbling out of the kiln. Its indications really mean nothing at all. If the thermocouple is so located that the kiln stream of gas has to strike it before there is any chance at dilution, the temperature indicated is close to correct, but thermocouples so located are short lived, and they hardly ever are so installed. Even then the streams from different levels of the rotary kiln will have different temperatures, as also they have different compositions.

Correction of Observed Temperatures

There is, however, a simple and satisfactorily accurate way out, and that is to take temperature anywhere along the line, to analyze the gases at the same point, which reveals the dilution, and then reduce the whole to zero air conditions. To do this with vertical kilns, a pyrometer is not even needed, as temperatures are low enough so a high reading glass thermometer can be used. In case of rotary kilns, a pyrometer is necessary and the best arrangement is to weld to the thermocouple a gas sampling pipe. Then both gas analysis and temperature will be obtained at the same point.

In case of vertical kilns, the writer often obtains a gas sample and temperature from the top of the stack; in case of a rotary kiln, wherever it is convenient to get in. He also used a great deal a high velocity thermocouple, which was a sampling pipe connected to a vacuum cleaner blower and motor. Within this pipe were the very small diameter, insulated, thermocouple wires, with the junction exposed at the opening of the pipe. In this way, not only were the gas sample and temperature obtained at the same point, but the gases rushed over the junction of the thermocouple at very high velocity, minimizing the radiation error, and indicating temperatures most accurately, and fluctuations of temperatures almost instantaneously.

Correction of temperature to zero air conditions can be readily calculated, or the chart presented herewith can be used.

Of course, all air found may not be leakage air. Some may come through the kiln as excess air, but even then the method is of value. It may be better to know kiln gas temperatures calculated back to no excess air, than to have them with excess air. The reason is that "temperature zero oxygen conditions" will be almost directly indicative of fuel loss; a kiln having twice the temperature above atmospheric would have close to twice the sensible heat chimney loss. Now temperature means nothing much, except a gas analysis is given, then temperature given as "temperature at zero oxygen" will mean a very definite something, and will enable a comparison of different kilns much better than now. Also, at present, no reliance can be placed on the stated temperature, as chances are very much that, due to dilution, they are not correct anyway. But "temperatures at zero oxygen" will be correct and revealing.

Test of Vertical Kiln

Recently a vertical kiln was tested, which had a recording pyrometer with thermocouple located in the suction of the induced air fan. The kiln was charged only during the day time. Temperatures during the day ranged between 200 to 270 deg. F. Early in the morning, before they started to charge, they were 430 deg. F. One would call such temperatures very good indeed. However, the gases contained 15.8% oxygen, which means they were 76% air, all of which leaked in through the top. Calculated back to the zero oxygen common basis, the conditions revealed were in startling contrast.

	Day operation Minimum	With rock charging Maximum	Night operation no charging Maximum
Indicated temperatures	200 deg. F.	270 deg. F.	430 deg. F.
Corrected temperatures	600 deg. F.	880 deg. F.	1560 deg. F.

Now it happens that these true temperatures are exceedingly high, of which there was no previous idea. The early morning conditions were even worse than those that prevail ordinarily in rotary kilns, and there is something seriously wrong in either design or control when a vertical kiln has temperatures as high as the rotary.

Tests of Rotary Kilns

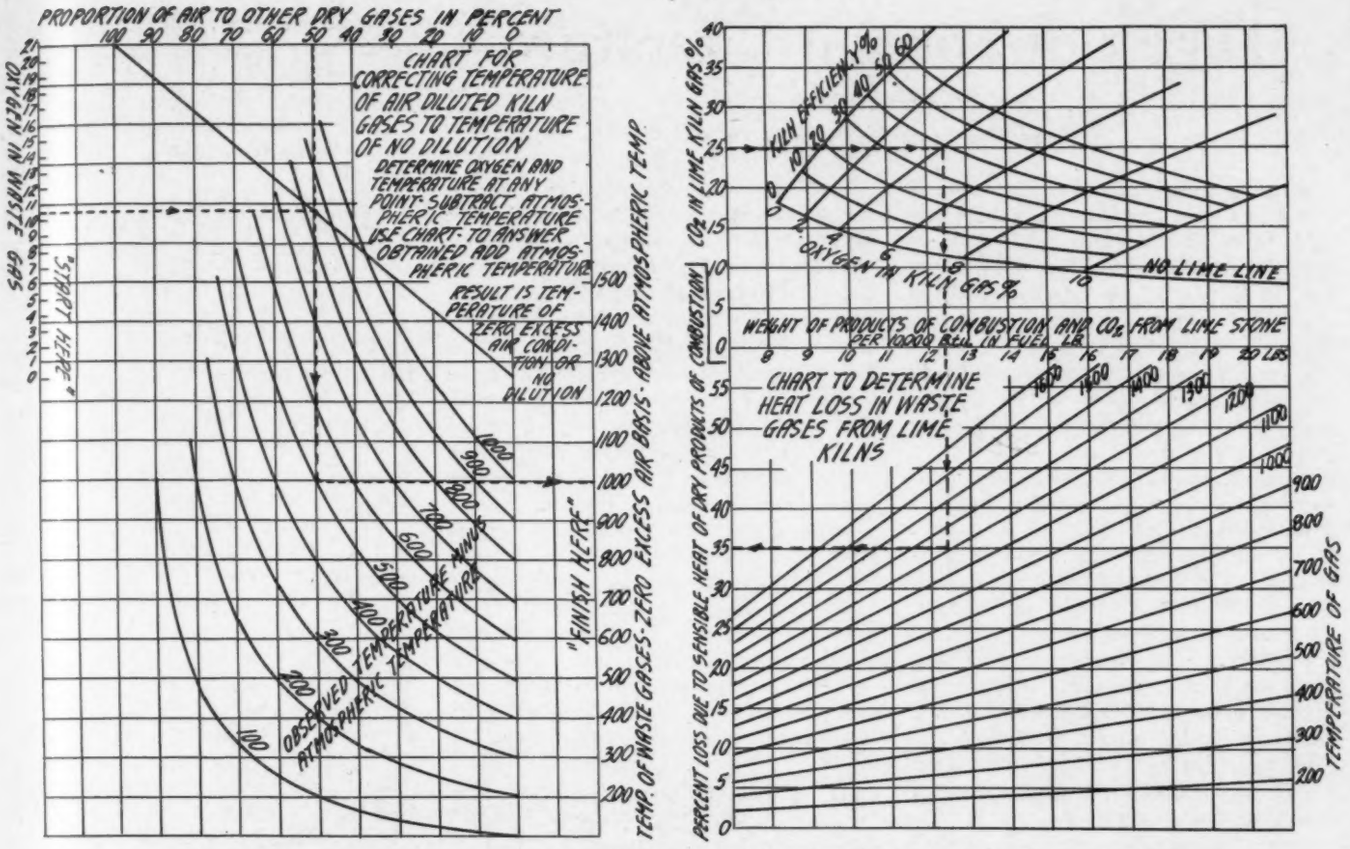
Another example can be given also of recent occurrence—in this case a rotary kiln making high calcium lime. The dust chamber pyrometer showed a temperature somewhere around 400 or 500 deg. F., but everyone realized that actual temperatures were much higher; no one, however, knew how very high they actually were. Gases were analyzed and actual temperatures determined. The most convenient point was right at the stack; oxygen, of course, was here very high, due to leakage through the seal ring and the various cleanout doors of the dust chamber and through its cracked, leaky walls.

Results were as follows: CO_2 18%, oxygen 8.2%, air of total dry gas 39%. Temperature as measured 1090 deg. F; corrected temperature to zero oxygen 1700 deg. F. This is very high temperature indeed and the reason why it was so high was that the kiln operated with insufficient air and discharged carbon monoxide, which burned as soon as it received the air at the seal ring. Through this secondary combustion the gases were heated up, and this suggested method is the only one that reveals such conditions. With complete combustion taking place in the kiln, temperatures would have been much lower and the heat would have gone to making of lime.

The analysis showed, of course, no CO, as all of it was burned in the dust chamber, but that there was CO in the gases leaving the kiln everyone could have seen readily by the flaming conditions at the kiln end.

In another case it was a rotary kiln sintering dolomite, where conditions of high temperature also prevailed, but for the exactly opposite reason. It was determined that CO_2 was 13%, oxygen 11%, air of total gas 52%, temperature at the stack 930 deg. F. Temperature corrected to zero oxygen condition was 1850 deg. F. In this case the reason was very large quantities of excess air passing through the kiln. Heat loss, of course, was immense and kiln efficiency very poor. Apparently conditions at the kiln outlet were not excessively hot at all; the recording pyrometer showed even very low temperatures, but actually stack heat loss was about 50% and kiln efficiency below 30%.

Except for the comparatively low loss of heat along the gas path, dilution with air does not destroy the possibility of obtaining temperature. But to know the temperature gives us no idea of the sensible heat


PROPORTION OF AIR TO OTHER DRY GASES IN PERCENT
CHART FOR CORRECTING TEMPERATURE OF AIR DILUTED KILN GASES TO TEMPERATURE OF NO DILUTION
DETERMINE OXYGEN AND TEMPERATURE AT ANY POINT: SUBTRACT ATMOSPHERIC TEMPERATURE USE CHART: TO ANSWER OBTAINED ADD ATMOSPHERIC TEMPERATURE
RESULT IS TEMPERATURE OF ZERO EXCESS AIR CONDITION OR NO DILUTION
OBSERVED TEMPERATURE MINUS ATMOSPHERIC TEMPERATURE
"FINISH HERE"
"START HERE"
OXYGEN IN WASTE GAS
TEMP. OF WASTE GASES: ZERO EXCESS AIR BASIS: ABOVE ATMOSPHERIC TEMP
KILN EFFICIENCY %
CO2 IN LIME KILN GAS %
OXYGEN IN KILN GAS %
NO LIME LINE
WEIGHT OF PRODUCTS OF COMBUSTION AND CO2 FROM LIME STONE PER 10000 B.t.u. IN FUEL LB.
CHART TO DETERMINE HEAT LOSS IN WASTE GASES FROM LIME KILNS
PERCENT LOSS DUE TO SENSIBLE HEAT OF DRY PRODUCTS OF COMBUSTION
TEMPERATURE OF GAS

Charts used for correcting observed temperatures and for calculating heat lost in waste gases

loss in the waste gases of lime kilns. However, the idea of relationship can be carried farther.

It is now some fifteen years since the writer first suggested that CO_2 percentage in kiln gases, in relation to oxygen percentage obtained, can be used to determine kiln efficiency; this because for any fuel there can be only so much CO_2 from carbon, and if any more is found it comes from stone, and the more there is of this surplus, the more stone is calcined, to the amount of fuel burned. The relationship of CO_2 to O, once established, can not again be destroyed. One can dilute the gases with air to any amount, which will reduce the CO_2 and raise the O, but that initial relationship will still remain.

Relationship of Gas Analyses and Kiln Efficiency

The writer once made the apparently very foolish statement that if he had a gas testing instrument sensitive enough, he could determine kiln efficiency by analyzing the gases passing over the next hillside. It may sound ridiculous, but it is nevertheless true.

Different Results of Same Kiln at Same Time

To know what kind of gases come up through the vertical or rotary kiln is important to judge combustion, as to whether there is enough or too much air, but that is all. To judge efficiency it is best to get far away where the many different streams have had a chance to become mixed.

A rotary kiln sintering dolomite was tested by analyzing the discharging waste gas by inserting the pipe to different levels of the stream, and a most surprisingly stratified flow was found. The uppermost stream contained hardly more than the normal amount of CO_2 from combustion of carbon; the lowest stream, traveling adjacent to the stone, was very high in CO_2 as the following tabulation shows:

Location of sampling pipe: feet from top of kiln	CO_2, per cent	O, per cent	Efficiency, per cent
1	14	6.4	7
2	17.5	5.5	16
3	20	4	19
4	23	4	31
5	30	2.7	50
6	32.5	3.5	70

This shows that there is but little mixing of gases in the rotary. It does not show, however, that the upper stream is not doing any work. It may, on the contrary, do a great deal by radiation, but not by convection. It is only the lower stream that does much contacting. It may also be due to faster travel of the upper stream, but whatever it is, it is; and one not aware may get just about anything and become beautifully tangled up.

It should be realized that dolomite dissociates closer to the feed end of the kiln and that on a kiln burning high calcium stone differences will not be so pronounced, as the CO_2 gas from stone travels farther and so has a better chance to mix. But even on high calcium lime kilns the condition is quite noticeable.

In the case of vertical kilns, when conditions are right, the different gas streams coming up will be fairly alike, but when they are not right, there can be an immense difference even with one section disgorging gas high in CO and another gas high in oxygen. So in this case, as well as in the rotary kiln, the sample intended to determine efficiency should be taken far back; from discharge of the fan probably. The same gas analysis used to determine zero oxygen temperatures will do quite well. All that is necessary is that a good Orsat apparatus with good solutions be carefully used and all oxygen absorbed and carefully measured.

With this information and the temperature of the drawn sample and the use of the chart here presented, the following information that is quite pertinent to good kiln operation, can be obtained:

(1) Kiln efficiency as a heat absorber.

(2) Percent of heat lost up the stack as sensible heat.

(3) Weight of gases passing up the stack per 10,000 B.t.u. in fuel.

(4) Temperature of gases passing to the stack.

(5) Temperature of gases leaving kiln under zero oxygen conditions.

Plant for Dry Ice

Miami Lime and Chemical Co., Miami, Fla., recently installed equipment made by the York Ice Machinery Co. to manufacture solid CO_2 or dry ice.

Digest of Foreign Literature

By F. O. Anderegg,
Consulting Specialist, Newark, Ohio

Simultaneous Production of Iron and Portland Cement in Rotary Kiln. The application of the L. Basset patent (French 697,952) in the Moncada, Spain, works of the Asland Portland Cement Co. is described by Patricio Palomar Collado in *Tonindustrie Zeitung* (1935) **60**, No. 10, p. 124; No. 11, p. 141, prefaced by editorial comments on this interesting subject. The editors describe briefly the Krupp direct process of iron reduction in a rotary kiln, which produces a sponge iron structure containing considerable slag inclusions, and mixed in with the rest of the solidified slag at the end of the process. On crushing, the large iron clumps are readily separated from the bulk of the slag, while a magnet will remove the fine iron particles. These are then agglomerated by a swedging or welding action into blooms. As to whether the Basset process, described below, will be profitable is not stated by the author and the editors are much concerned about this.

The author points out that if attempts are made to produce iron in the usual rotary kiln troubles, including severe attack on the lining, are experienced because of the melting of the slag, but if the lime content is increased sufficiently, the slag does not melt, so that it is possible to produce a very well burned but unmelted portland cement, and at the same time melt the iron so that separation is easily obtained. Two viewpoints are held at present regarding the theory of iron reduction in the blast furnace. One school holds that the high temperature alone is responsible for the complete reduction, while another maintains that to secure a complete reduction it is necessary to maintain a high carbon content in the reduced iron. Neither hypothesis is correct, as it is not at all difficult to secure complete reduction at 900 deg. C., and it has been shown unnecessary to dissolve appreciable amounts of carbon to bring the reaction to completion. The problem is to keep oxygen of CO_2 from contacting the hot iron, and this is handled by protecting the freshly reduced iron at all times by an atmosphere of CO and H_2.

The method proposed by Basset includes: The raw mix contains the iron ore, limestone and the reduction carbon which may be coke breeze, washed or unwashed anthracite, or similar materials. The raw mix is moistened slightly or may be introduced into the kiln in the form of a slurry. The kiln used is 45 M. long and 2.8 M. in diameter and may be divided into temperature zones. In the first zone the temperature reaches 700 deg. C. and the water is evaporated, the coal starts to burn and the reduction of the ore begins. In the next region the temperature rises to about 850 deg., the reduction continues and the decarbonation of the limestone starts. In the third zone, with the temperature rising to 1250, the reduction continues, the decarbonation is completed and the lime vigorously reacts with silica and alumina. The fourth zone corresponds to the sinter zone in the portland cement kiln. In the fifth zone the iron is melted, with the calcareous materials floating on top. At the end of this zone an opening permits the egress of the molten iron at every revolution. In the last zone the cement is cooled to 1100 and oxidized, falling next into a cooler, from which it passes over a magnet to remove iron and goes to clinker storage.

In the upper part of the kiln ordinary refractories are used, but in the lower part the kiln is lined with portland cement clinker blocks. A ring is built to separate the melting and cooling zone, so as to permit separation of the iron and clinker. The iron runs into a 6-ton, small rotary kiln heated with powdered coal, where ferrosilicon is added to give a product of chemical combination within narrow limits and practically free from phosphorus and sulfur. Any manganese in the ore appears in the iron and they have produced several hundred tons of 2.5% manganese pig iron. A typical analysis: C, 3.35; Si, 2.98; Mn, 0.78; S, 0.006 and P, 0.050. The portland cement, it is claimed, has the properties of ordinary cement. Specimens made according to the Spanish specifications, which involve earth-dry mixes, gave the following results:

	24 hours	3 days	7 days	28 days
Tensile	210	278	320	463
Compression	1710	3000	3420	5125

when ground to 7.2% residue on a 176-mesh sieve. The author points out that the process has now passed the experimental stage and has settled down into steady production, but refuses to be bold enough to claim anything for the economy of the process, because he is a cement man rather than an iron man.

Problem of Hardening of Lime Mortar. On the continent of Europe, lime is extensively used in mortars for unit masonry, for inside plaster and even for outside stuccoing. For these purposes hydraulic limes are usually employed, but the time required to reach a set and acquire some strength tends to slow down building operations so that a study has been made by V. Rodt of the hardening process. He follows the old colloid concept of Prof. Michaelis, Sr., and quotes the following data obtained by the younger Michaelis in 1902 (table below).

These results indicate adequate potential strength from the gel alone obtained from lime putty on drying out, but the problem lies in getting it dried out. Experience shows that lime putties, especially when rich, may require many hundred or even thousands of years for proper drying. In addition, special tests show that until drying out does occur CO_2 from the air has no opportunity to react. *Tonindustrie Zeitung* (1936) **60**, No. 8, p. 97.

Hydrated	Lime			Silica				
Water content of gel, % of dry hydrate	40	27	20	16	100	73	45	25	1
Compr. str., lb. sq. in.	0	500	1140	1500	1210	2850	8000	11,950	14,000
Hydrated	**Alumina**				**Iron Oxide**				
Water content of the gel, % of dry hydrate	48	32	23	12	60	34	21	14	
Compr. str., lb. sq. in.	2200	3780	5750	9000	2060	4550	7050	11,500	

Steam Hardening of Concrete Blocks. The first question to be answered was the effect of clay in the sand on strengths, and it was found that the addition of clay to as much as 20% of the weight of the sand had a beneficial effect on both the compressive and tensile strengths in 1:3, 1:5 and 1:7 mixes after curing for 12 hours at 120 lb. steam pressure For instance, in a mix containing 1 cement, 0.6 clay, 2.4 sand by weight, the compressive strength was about double that of the standard strength at 28 days for the same cement. The resistance to freezing was not determined. The next question to be answered involved elimination of crack formation during the autoclaving, which is divided into three periods: the heating up, the maintenance of temperature, and the cooling down. When the steam pressure was increased very rapidly, trouble was encountered, and it was necessary to warm and cool slowly, especially in winter. Heating up was controlled with a thermometer, the pressure gage being worthless in the lower ranges. The air should be allowed to escape as the steam enters, so that the temperature may reach a maximum. For blocks 19 x 19 x 39 cm., a rise of about 40 deg. F. is recommended, per hour, requiring about 8 hours for warming up, 8 for indurating and 5 or 6 for cooling. In addition to sand, half of the aggregate used was a good quality of dolomite, crushed rather fine. The cement content should be below 3 bags per cubic yard, or above 8 bags, to avoid crack development. The strengths were about double those at 28 days with ordinary curing. The penetration of water during one hour at a pressure of 90 lb. per sq. in. was about 75 to 80 mm. The results were reported by A. W. Woljenski in *Zement* (1935) **24**, No. 36, p. 570.

Action of Carbon Dioxide on Hardened Cement. The usual carbonation of lime set free during the hydration of cement is gradually followed by the promotion of the hydrolysis of the silica and alumina compounds found in the cement, whereby the active lime is neutralized and reduced greatly in solubility, while the silica and alumina gels formed slowly undergo rearrangement with hardening. The silica gel may even be changed gradually to a form capable of resisting the solvent action of hydrochloric acid, so that it will be missed in analyzing a mortar or concrete, thereby throwing off the determination of the cement content. A. Steopoe. *Zement* (1935) **24**, No. 50, p. 795.

Labor Requirements in Cement Production

THE United States Bureau of Labor Statistics has published the results of its investigation to determine the effect of the government purchases of cement on employment, as a reprint (Serial No. R. 358) from the *Monthly Labor Review* (March, 1936). The author is Bernard H. Topkis.

The study was (probably necessarily) incomplete in that it did not take into account labor other than that employed in supplying gypsum, coal, power and steel (grinding media and bag tie wire only) in addition to the employment in the cement industry itself. No attempt was made to trace the employment at machinery and equipment plants resulting from purchase of repair parts and new equipment by the cement industry. It is this far-reaching effect of the stimulation of any materials-of-construction industry that is of the most economic importance. Following is a table summarizing man-hours required in cement manufacture proper in 1934, based on returns from 102 mills:

TABLE 1. MAN-HOURS REQUIRED IN MANUFACTURE OF CEMENT, 1934.

Class of work	Man-hours per 100 barrels	Total man-hours (102 plants)
Quarrying	7.7	4,478,875
Processing	18.0	10,485,586
Shipping	6.3	3,662,391
Maintenance	8.5	4,922,623
Mill overhead	7.1	4,123,518
Administration	7.4	4,301,856
Total	55.0	31,974,849

Large differences in labor requirements were found at different mills because of varying rates of operation, percentage of capacity used, geographical location, etc. Some of these figures mean little unless all the facts are known; for example, it would appear that the lowest labor requirement was on the Pacific coast; but it will be recalled that in 1934 the West Coast mills operated to larger percentages of capacity than the mills elsewhere.

It was found by a study of 12 mills that it required 140% more man-hours per 100 bbl. to operate one kiln in a 5-kiln plant (or at 20% of capacity) than it did to operate at full capacity; it required 48% more man-hours per bbl. to operate a single kiln in a 2-kiln plant (or at 50% capacity) than at full capacity. It was also concluded that it takes appreciably fewer man-hours to produce cement in large plants than in small ones, but this seems open to question without a full discussion of all other relevant factors.

Optimism Grows

THE PORTLAND CEMENT INDUSTRY will operate in the black during the current year for the first time since 1931, according to present indications, says the *Wall Street Journal* (New York City) of May 28, which continues with the following comment. Although for the past two years or so certain producers have reported moderate earnings due to special favorable circumstances, the trade as a whole until recently was on an unprofitable basis. This year, however, reflecting a substantial advance in sales accompanied by a relatively stable price structure, it is likely that a number of additional manufacturers will operate profitably and that those that have been making money will enjoy a further earnings upturn.

April sales were 46.6% over April, 1935, advancing to 9,089,000 bbl., the highest monthly total since September, 1932. Last month's results followed gains of 46.3% in March, 6.9% in February and 36.6% in January. During the first four months volume was 37.9% higher than in the like 1935 period, at 23,272,000 bbl.

Leading interests in the industry foresee a sales gain of at least 25% this year. This figure represents an upward revision of about 5% during the past month because of the greater than anticipated bulge in demand.

Currently the industry is running at about 40% of capacity, with prospects pointing to a 35% ratio for the entire year. This would compare with a ratio of 28.6% in 1935, 29% in 1934 and the low point of 23.6% in 1933. The capacity of the country's 163 plants is estimated at 262,700,000 bbl.

Currently practically all sources of demand are drawing on producers for increased cement supplies. Foremost among these is the construction industry, which in the first four months of 1936 showed an increase in contracts awarded of 85% with a total of $780,627,000 in the 37 eastern states.

Buying for highway construction and grade separation work is developing in good volume with the advent of seasonal weather. The outlook for orders from this line is the brightest in years.

Producers in the Lehigh Valley area are considerably perturbed over the action of a medium-sized manufacturer who is understood to have booked up to full capacity for the year because of granting price concessions. Although this situation is being watched closely by the trade, the disposition is to take no action that might endanger the present general price structure. This attitude is largely made possible by the current uptrend of demand which has more than offset the business lost by the lower offering price. Also, the fact that the mill in question is fully booked and therefore not in a position to make further inroads into its competitors' volume has acted as a stabilizing influence.

Constantly increasing imports of the foreign product are proving a disturbing influence in the seaboard markets, particularly in big consuming ports of New York and Boston. So far this year imports have run 159% ahead of a year ago and this in turn has been on top of an advance of 132% for the entire 1935 year. During the three months ended with March foreign cement landed totaled 176,741 bbl., while for the full year 1935 the total was 618,043 bbl.

TABLE 2. AVERAGE NUMBER OF MAN-HOURS REQUIRED TO PRODUCE 100 BBL. OF CEMENT IN 88 MILLS IN 1934, BY ANNUAL PLANT CAPACITY

Capacity[1]	Number of plants	Average man-hours per 100 bbl. — Total	Quarrying	Manufacturing[2]	Shipping
All plants	88	47.6	7.7	33.6	6.3
Over 3,000,000 bbl.	4	40.0	6.2	27.8	6.0
2,500,000 to 2,999 999 bbl.	6	47.5	7.0	34.1	6.4
2,000,000 to 2,499,999 bbl.	10	49.3	9.3	33.0	7.0
1,500,000 to 1,999,999 bbl.	29	48.5	6.7	35.5	6.3
1,000,000 to 1,499,999 bbl.	29	56.0	8.3	41.0	6.7
Under 1,000,000 bbl.	10	64.5	13.2	43.7	7.6

[1]Annual capacity has been measured by multiplying by 4 the output for the 3 highest consecutive months.
[2]Does not include administrative labor.

New Coal Mills

Pennsylvania-Dixie Cement Corp., New York City, has made alterations and installed new equipment at its Valley Junction, Ia., plant, costing approximately $35,000. Two B & W coal mills have just been added.

To Make New Products

Petoskey Portland Cement Co., Petoskey, Mich., has added about $100,000 in new equipment since the first of the year to make new products, including high early strength cement, waterproof cement and mortar cement.

Doubles Capacity

Washington-Idaho Lime Products Co., Orofino, Wash., has completed improvements costing $100,000 and doubling the plant's grinding capacity for finished cement—300 to 600 bbl. per day.

Sand-Lime Brick Production and Shipments in April, 1936

THE FOLLOWING DATA are compiled from reports received direct from producers of sand-lime brick located in various parts of the United States and Canada. The accompanying statistics may be regarded as representative of the industry.

Nine sand-lime plants reported for the month of April, this number being three less than the number reporting for the month of March, statistics for which were published in May.

Average Prices for April

Shipping point	Plant price	Delivered
Pontiac, Mich.	$10.00	$12.50
Detroit, Mich.	....	13.50
Mishawaka, Ind.	9.25	....
Syracuse, N. Y.	14.00	16.00-20.00
Saginaw, Mich.	10.50	....
Sioux Falls, S. D.	12.00	....
Toronto, Ont., Can.	12.00	13.50

Statistics for March and April

	March†	April*
Production	2,219,625	1,449,150
Shipments (rail)	185,500	143,000
Shipments (truck)	2,129,381	1,688,015
Stocks on hand	1,600,098	1,102,939
Unfilled orders	7,928,000	1,753,400

†Twelve plants reporting; incomplete, three not reporting unfilled orders.
*Nine plants reporting; incomplete, two not reporting unfilled orders.

TRAFFIC and TRANSPORTATION

Proposed Rate Changes

THE FOLLOWING are the latest proposed changes in freight rates up to and including the week of May 23:

New England

38878. To amend Item 6645 of Van Ummersen's I. C. C. 270, which names Class 20 rating on **rubble stone** from So. Milford, N. H., and West Chelmsford, Mass., to N. E. and T. L. territories, except stations on the B. & M. R. R., by providing that this rating will apply from all stations on the B. & M. R. R. and Me. C. R. R. to all stations in O. C. territory, except that it is proposed to continue the present restriction providing for non-application of this rating locally between stations on the B. & M. R. R.; also, to cancel all commodity rates on this material applying between points involved and apply proposed Class 20 rating.

28998. **Crushed stone,** C. L., minimum weight 50 net tons, from Greenfield, Mass., to Holyoke, Mass. Proposed—50c per 100 lb. (To establish a rate which will move the traffic.)

38999. **Sand and gravel,** C. L., (See Note 1), except that when cars are loaded to visible capacity, actual weight will apply, from Libbys Pit (Leeds Jct.), Me., to Hardings, Me. Proposed—60c per 100 lb.

Trunk

Sup. 5 to 34000. **Slag,** C. L., (See Note 2), from Troy, N. Y., to stations on the Central Vermont Ry., New London, Conn., to Woodruff, Vt., incl., to stations on the Rutland R. R., Burlington, Vt., to Center Berlin, N. Y., incl., and to stations on the N. Y. N. H. & H. R. R., New Haven, Conn., to South Walpole, Mass., incl., and Sandy Hook, Conn., to Simsbury, Conn., rates ranging from $1.10 to $2 per net ton.

Sup. 1 to 34612. **Crude fluxing limestone,** C. L., (See Note 2), from Billmyer, Penn., to Yonkers and Nepperhan, N. Y., $2.45 per net ton.

Sups. to 34643. **Slag,** C. L., (See Note 2), from Carteret, Perth Amboy and Maurer, N. J., to Hartford, Conn., Boston, Millis and Clicquot, Mass., and all points in Boston Switching District, $2.60 per net ton.

34643 (Sup. 2 and 3). **Slag,** C. L., (See Note 2), from Carteret, Perth Amboy and Maurer, N. J., to all points in Boston switching district, $2.60 per net ton, and from Laurel Hill, L. I., N. Y., and from Nichols Siding, N. Y., to Hartford, Conn., Millis and Cliquot, Mass., and all points in Boston switching district $2.60 per net ton.

Sup. 1 to 34649. **Slate, roofing,** C. L., min. wt. 40,000 lb., from Bangor, Berlinsville, Chapman Quarries, Danielsville, East Bangor, Nazareth, North Bangor, Pen Argyl, Slatefield, Upper Bangor, Walnutport and Wind Gap., Penn., to London and Windsor, Ont., 28c per 100 lb.

Sup. 2 to 34649. **Roofing slate,** C. L., minimum weight 40,000 lb., from L. V. R. R. stations, Slatington, Penn., to Slatedale, Penn., to London and Windsor, Ont., 28c per 100 lb.

34692 and Sups. **Rock, ganister,** not ground, C. L., (See Note 2), to Alloy, W. Va., from Barrie, Brooks Mills, Flowing Springs, Moores Mills, Reedsville, Hannah, Harbison Walker Refractories No. 16, Madley, Mt. Union and Wolfsburg, Penn., Cumberland, Md., and Mellon, Va., $2.60 per net ton.

34696. **Stone, natural** (other than bituminous asphalt rock), crushed, coated,* C. L., (See Note 2), from New Hamburg, N. Y., to various stations in the state of New York, rates ranging from 95c to $1.50 per net ton.

M-3503. **Stone,** natural (other than bituminous asphalt rock), crushed, not coated, C. L., and **slag,** not ground, in bulk, in open top equipment, C. L., (See Note 2), from Buffalo, N. Y., to Allegany, Carrollton, Irvine Mills, Limestone, Olean, Salamanca, Vandalia and West Salamanca, N. Y., and Bradford, Penn., 90c per net ton. Includes East Bradford, Custer City, Howard Junction and Lewis Run, Penn., which are within switching limits of Bradford, Penn.

*Note—The oil, tar and/or asphaltum not to exceed 10% by weight of the commodity shipped, the shipper to so specify on shipping orders and bills of lading.

34701. **Crushed stone and screenings,** in straight or mixed carloads (not agricultural limestone or ground limestone, unburnt; fluxing stone or firestone; or stone, coated), (See Note 2), from Monocacy, Penn., to Lothair, Md., $1.60 per net ton.

34711. **Stone, crushed,** C. L., (See Note 2), from Lime Crest, N. J., to stations on the S. I. R. T. Ry., No. 12, Roselle, N. J., to 20, Bayway, N. J., $1.30; No. 25, Port Ivory, N. Y., to 105, Fort Wadsworth, N. Y., $1.35 per net ton.

34712. To cancel commodity rates on **roofing slate,** C. L., published in Agent W. S. Curlett's I. C. C. A-452, applicable from points of origin shown therein on the D. L. & W. R. R., L. & N. E. R. R. and L. V. R. R.; also from Granville, N. Y., on the D. & H. R. R. to Lexington, Ky.

34713. **Marble or stone,** crushed or ground (roofing granules), C. L., minimum weight 50,000 lb., from Cardiff, Md., to Watsontown, Penn., 13c per 100 lb.

34716. **Limestone,** ground or pulverized, C. L., minimum weight 60,000 lb. from Jamesville, N. Y., to Middleburgh, N. Y., $2.20 per net ton.

M-3506. **Roofing granules** (made from burned clay), C. L., minimum weight 60,000 lb., from Gladhill, Penn., to Cliquot, Mass., $3.90 per net ton.

34723. **Stone,** crushed, **slag, gravel and/or sand,** coated, in open top equipment, C. L., (See Note 2), from Marion and Roanoke, Va., to common points on the B. & O. R. R. and Western Maryland Ry., Cumberland, Md., and west thereof, in Trunk Line territory, rates ranging from $2.01 to $2.59 per net ton. Reason—To unify rates to common points via the two lines.

34726. **Slag,** carloads, (See Note 2), from Swedeland, Penn., to Elizabethport, N. J.; 81c per net ton, to apply F. O. B. cars at Elizabeth, N. J., on shipments destined beyond via water.

34738. **A, sand** (other than ground or pulverized or naturally bonded moulding), and **gravel,** in open top cars without tarpaulin or other protective covering, C. L.; **B. sand and gravel** (other than ground or pulverized), in closed cars, or in open top cars with tarpaulin, C. L.; **sand,** naturally bonded moulding, in open top or closed cars, C. L.; **C, sand,** ground or pulverized, C. L.; (See Note 2), from Newport, N. J., and various stations in southern New Jersey, to Methuen, Mass. **A,** $3.35; **B,** $3.35, and **C,** $3.64 per net ton.

34741. **Stone, crushed,** C. L., (See Note 2), from White Haven, Penn., to points in Pennsylvania, on the N. Y. O. & W. Ry., D. & H. R. R., Erie R. R. and W. B. & A. E. Ry., rates ranging from $1 to $1.40 per net ton.

34749. **Stone, natural** (other than bituminous asphalt rock), crushed, or crushed coated with oil, tar and/or asphaltum, C. L.* (See Note 2), from Catskill, N. Y., to various points in New York on the N. Y. C. R. R., rates ranging from $1.10 to $1.90 per net ton not coated and from $1.20 to $1.90 per net ton coated.

34756. **Stone,** broken or crushed, C. L., (See Note 2), from Plattsburg, N. Y., to Alburg, Vt., rate $1.20 per net ton.

34758. **Slate,** crushed, dust or ground, C. L., minimum weight 50,000 lb., from Muncy, Penn., to Watertown, Conn., 18½c per 100 lb.

34759. **Limestone,** crude, fluxing, foundry and furnace, when shipped in open-top equipment, C. L., (See Note 2), from Engle, Martinsburg, W. Va., Capon Road, Stephens City and Strasburg Jct., Va., to Mansfied, Ohio, rate $2 per gross ton.

34765. **Stone,** crushed, and screenings, (not agricultural limestone or ground limestone, unburnt; fluxing stone or firestone; or stone, coated), (See Note 2), from Dalmatia, Penn., to Forest City, Mayfield and Lake Ariel, Penn., $1.40, Pittston, Penn., $1.30, and Plymouth, Penn., $1.20 per net ton.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

34766. **Slag,** C. L., (See Note 2), from Swedeland, Penn., to Manville, N. J., 86c per net ton.

34789. **Stone,** crushed, coated with tar, oil, asphaltum, C. L., (See Note 2), from Wertz, Penn., to Clarksburg, Juneau, Home and Marion Center, Penn., $1.46, to Creekside, Penn., $1.37, to North Point, Penn., $1.55 per net ton.

34793. **Roasted dolomite** (refractory dolomite, in grandular form, treated or untreated, clinkered and/or burned to a dead state), C. L., minimum weight 60,000 lb., from Blue Bell, Penn., and Williams, Penn., to Coatesville, Penn., $1.13 per net ton.

M-3519. **Gravel, sand, slag and stone,** crushed, coated,* in bulk, in open top equipment, in straight carloads, (See Note 2), from Greer, W. Va., to various points in Pennsylvania, rates ranging from $1.28 to $1.71 per net ton.

Central

46618. To establish on **sand and gravel,** carload, (See Note 2), from Riverton, Ind., to Switz City, Bloomfield and Bloomington, Ind., 50; from Indianapolis, Ind., to Morgantown and Bloomington, Ind., 50c per net ton.

46631. To establish on **crushed stone,** C. L., from Putnamville, Ind., to Clay City, Ind., 61c per net ton.

46660. To establish on **core sand,** C. L., from Vassar, Mich., to Oshawa, Ont., 361c per net ton.

46738. To establish on **stone, rip rap, rubble and quarry scrap,** in straight or mixed carloads, from Glenmont, O., to Parkersburg, W. Va., 176c Pittsburgh, Penn., 189c, and Lansing, Mich., 227c per net ton.

To establish on **feldspar,** crushed, not ground or pulverized, carload, minimum weight 60,000 lb., from Canadian shipping stations to points in Central Freight Association territory, 70% of 6th class.

46768. To establish on **refuse foundry sand,** C. L., minimum weight 50,000 lb. from Muncie, Ind., to Indianapolis, Ind., 126c per net ton. Via P. R. R.

46784. To establish on (A) **Sand,** naturally bonded moulding, in all kinds of equipment, C. L.; sand, except naturally bonded moulding; ground or pulverized sand, in closed equipment, C. L. (B) Sand, ground or pulverized, in all kinds of equipment, C. L. (C) Sand (except naturally bonded moulding; ground or pulverized sand) and gravel† in open top equipment, C. L., from Zanesville, O., Oil City, Penn., Canton, O., M. & S. Valleys and Howard, O., groups to points in Connecticut, Massachusetts, Rhode Island, Delaware, Maryland, New Jersey, Pennsylvania and Virginia, rates ranging from 230c to 501c per net ton.

†Proposed rates on gravel to apply from Phalanx, O.

46786. To cancel rates on **limestone, agricultural,** in bulk and open top cars (Rate Col. E), and **limestone, agricultural,** in box cars (Rate Col. F), published in Section 2, pages 36 to 42 of B. & O. R. R. Tariff H-3486-B, and as amended, from Mitchell, Ind., to points in Illinois, Indiana, Iowa, Kentucky, Michigan, Missouri, New York, Ohio, Pennsylvania, West Virginia and Wisconsin, class rates to apply in lieu thereof.

46823. To establish on **sand,** building and core and **gravel,** C. L., (See Note 3), but not less than 60,000 lb., from St. Davids and Stamford, Ont., to Detroit, Mich., 230c per net ton, plus emergency charge.

46835. To establish on **sand** (except industrial, and **gravel,** in bulk, in open-top cars, from Marion, O., to Mt. Gilead, O., 50c per net ton.

46846. To establish on **crushed stone,** in open-top cars, C. L., from Lewisburg, O., to Silverton, O., 90c per net ton, subject to provisions of C. F. A. Emergency Charge Tariff 542-A.

46851. To establish on **sand** (except industrial), and **gravel,** in open-top cars, C. L., from Heath, O., to Columbus, O., 60c per net ton.

46853. To establish on **asphaltic limestone,** having a natural asphaltic content of 2 but not more than 5½% broken, crushed or ground, C. L., (See Note 3), from Hillsboro, O., to destinations in Ohio, rates on the basis of mileage scale prescribed by the I. C. C. in Docket 23236. Proposed rates to representative destinations are: To Akron, 190c; Athens, 140c; Chillicothe, Cincinnati, 110c; Columbus, 120c; Dayton, 130c; Defiance, Findlay, Fostoria, 180c; Hamilton, 110c; Lima, Mansfield, 160c; Marion, 170c; Massillon, 180c; Middletown, 120c; Mt. Vernon, 150c; Newark, Piqua, 140c; Portsmouth, 130c; Sandusky, 180c; Springfield, 140c; Toledo, 180c; Washington C. H., 100c; Youngstown, 200c, and Zanesville, O., 150c per net ton.

46855. To establish on **sand** (except ground, pulverized or naturally bonded moulding), C. L., to Ypsilanti, Mich., from Calumet, Crocker, Gary and Willow Creek, Ind., 135c per net ton.

46867. (a) To establish on **firestone,** sawed or chipped, C. L., minimum weight 60,000 lb., from New Castle, Penn., to points in Official territory, rates in cents per net ton as shown:

Aliquippa, Penn.	135	Pittsburgh, Penn.	135
Buffalo, N. Y.	250	Port Huron, Mich.	310
Butler, Penn.	135	Sharon, Penn.	90
Cleveland, O.	160	Springfield, O.	240
Chicago, Ill.	325	Vandergrift, Penn.	210
Detroit, Mich.	240	Weirton, W. Va.	150
Donora, Penn.	195	Youngstown, O.	90
East Moline, Ill.	470	Camden, N. J.	400
Farrell, Penn.	90	Rochester, N. Y.	280
Kalamazoo, Mich.	295	Sparrows Point,	
Lorain, O.	160	Md.	380
McKeesport, Penn.	135	Steelton, Penn.	380
Middletown, O.	240	Worcester, Mass.	480
Midland, Penn.	140	New York, N. Y.	440

(b) To cancel present commodity rates on **firestone,** rough dressed, quarried, C. L., minimum weight 60,000 lb., from New Castle, Penn., to various points in Official territory, published in P. R. R. Tariff I. C. C. 1492, column 17½ rating to apply in lieu thereof.

46872. To establish on **crushed stone,** in open top cars, C. L., from Melvin, O., to Blanchester, O., $15 per car, to apply only on movement of three or more cars at same time.

46883. To establish on **sand** (except naturally bonded moulding: ground or pulverized), C. L., (See Note 3), but orders will not be accepted for closed and open top cars of less marked capacity than 60,000 and 80,000 lb., respectively, from Chicago, Ill., to Logansport, Ind., 140c in box cars and 100c per net ton in open top cars. Via P. R. R.

46890. To establish on **stone,** crushed, coated,* in open top equipment, C. L. (See Note 3), from Erie, Penn., to Du Bois, Penn., 146c per net ton, subject to emergency charges.

Southern

11480. Establish rates on **crushed or rubble stone, carload,** (See Note 3), from Boxley, Va., to N. S. R. R. stations observing same basis as prescribed from Rocky Point, Va., in I. C. C. Docket 22315, i. e., the Docket 15717 scale applied to the short workable routes plus N. S. R. R. relief line arbitrary of 25c per net ton, but observing as maxima the Docket 17517 scale applied to the Docket 13494 routes plus 45c per net ton.

11513. Establish from Ketona, Ala., rates of 158c per net ton to Mobile, Ala., and 177c per net ton to New Orleans, La., on **limestone, ground or pulverized, carload,** minimum weight 67,000 lb., except when marked capacity of car is less, in which event (See Note 1).

11529. Establish the following rates, in cents, per ton of 2000 lb. on **feldspar,** carload, minimum weight 60,000 lb.:

To	From—Black Mountain, N. C.	From—Bryson, Sylva, N. C.
Ironton, O.	404	416
Portsmouth, O.	404	416
Jeffersonville, Ind.	452	464
Nashville, Tenn.	327	327
Jacksonville, Fla.	388	400

11537. Publish same rates on **fullers earth,** carloads, from Ochlocknee, Ga., as are now published in A. C. L. R. R. Tariff, I. C. C. B-285S, from Attapulgus, Ga., to Lake Junction, N. J., Bradford, Penn., Buffalo, N. Y., and Tyrone, Penn.

11557. Establish rates of 33c per 100 lb. from Group 1 origins and 37½c from Groups 2 and 3 origins as named in Agent Emerson's Freight Tariff 9-E, I. C. C. 220 to St. L. & H. R. R. stations, Bowling Green, Mo., to Salt River, Mo., inclusive, on **oyster shells,** carload, as described in Item 230 of the tariff.

11571. Establish rate of 262c per ton of 2000 lb. on **limestone or marble,** ground, C. L., minimum weight 88,000 lb., from Cartersville, Ga., and Sparta, Tenn., to St. Louis, East St. Louis and Belleville, Ill.

11571 (Amdt. 1). Suggesting rates on **limestone and marble,** ground or pulverized, C. L., amended to provide that proposed rate to St. Louis, Mo., is to apply only for St. L. Terminal R. R. Assn. delivery and also to provide that proposed rate to E. St. Louis, Ill., is to apply only for St. L. Terminal R. R. Assn. and Penn. R. R. deliveries; also to provide that present rates to St. Louis, Mo., and E. St. Louis, Ill., will be continued on other traffic.

11647. Establish rate of 162c per net ton on **limestone, ground or pulverized, C. L.,** min. wt. 67,000 lb., except where marked capacity of car is less (See Note 1), from Calera, Ala., to Pensacola, Fla., for export.

11708. Establish rate of 140c per net ton (plus 5c per net ton emergency charge), from Talbird, N. C., to Draper, N. C., on **sand,** carload, minimum weight 100,000 lb., (See Note 3).

11725. Cancel, as obsolete, present rates on **sand and gravel** from Ashland, Covington, Newport, Winchester, Ky., and Cincinnati, Ohio, to Lexington, Winchester, Mt. Sterling and Maysville, Ky., permitting class or combination rates to apply.

Western

Sup. 1 to D-41-155. **Gypsum rock,** C. L., (See Note 3), but not less than 60,000 lb., from Medicine Lodge and Sun City, Kan. (rates in cents per 100 lb.): To Birmingham, Ala., 24; Boyles, Ala., 24; Leeds, Ala., 24; No. Birmingham, Ala., 24; Phoenixville, Ala., 24; Ragland, Ala., 24; Spocari, Ala., 28½.

D-41-156. **Stone,** crushed; **limestone,** agricultural (not ground), in bulk in open top cars per Item 1370, W. T. L. Tariff 49-T, (See Note 2), but not less than 60,000 lb., from Ablemans, Wis. Rates in cents per net ton to points in Indiana: Anderson, 301; Connersville, 326; Cottage Grove, 326; Gaston (C. & O.), 288; Hartford City, 290; Knightstown, 313; Kokomo, 250; Liberty, 326; Lostantville, 301; Marion, 288; Muncie, 301; New Castle, 313; Peru, 250; Portland, 301; Red Key, 301; Richmond, 313; Rushville, 326.

D-41-157. **Sand,** molding, C. L., (See Note 3), from Boulder, Lafayette, Louisville and Superior, Colo., to St. Louis, Mo., and E. St. Louis, Ill. Proposed, $4.40 per ton of 2000 lb.

D-41-158. **Sand** (except naturally bonded moulding; ground or pulverized sand), in open top equipment, (See Note 3), but not less marked capacity than 80,000 lb., from Clayton, Iowa. Proposed rates in cents per net ton: To Bay View, Wis, 145; Beloit, Wis, 125; Chicago, Ill., 170; Fond du Lac, Wis., 145; Freeport, Ill., 115; Janesville, Wis., 125; Madison, Wis., 115; Milwaukee, Wis., 145; Racine, Wis., 170; Racine Jct., Wis., 170; Rockford, Ill., 125; South Beloit, Wis., 125; Waukegan, Ill., 170; Waukesha, Wis., 135.

D-41-159. Rates: **Limestone,** ground, C. L., (See Note 3), but not less than 40,000 lb.., in open top cars, or 54,000 lb. in cars other than open top. In no cases will orders be accepted for cars of less than 60,000 lb. marked capacity. From Valmeyer, Ill. Proposed—To Cresco, Ia., 20c; to Elkader, Ia., 21c; to Waukon, Ia., 21c.

D-41-161. **Stone,** crushed, **rubble stone,** as per Item 2420 of W. T. L. Tariff 6-S, from Ablemans, Wis., to Keokuk Ia. Proposed—9½c per 100 lb.

E-41-162. **Stone,** crushed, C. L. Minimum weight as shown in Item 2420B of W. T. L. Tariff 6-S. From Ablemans, Lohrville and Red Granite, Wis. To St. Louis, Mo. Proposed—12½c per 100 lb.

C-41-163. **Stone,** natural, other than bituminous asphalt rock, viz.: Crushed or ground, (See Note 3), from Spencer, S. D. Rates in cents per 100 lb. To Fremont, Neb., 9; Valley, Neb., 9.

D-41-164. **Sand,** silica, C. L., (See Note 3), from Klondike, Mo., to Denver, Colo. Proposed—$3.95 per ton of 2000 lb.

E-43-23. **Stone,** all kinds, including building, curbing or paving (rough or dressed, not carved, lettered, polished, or traced). (See Note 1), except that shipment loaded in cars of 40,000 lb. capacity, minimum weight will be 38,000 lb., from Milbank, S. D., Ortonville and Sacred Heart, Minn., to Council Bluffs, Ia., and Omaha, Neb. Proposed 14c per 100 lb.

C-43-25. **Stone or marble,** rough, C. L. Minimum weight—40,000 lb. From Chicago, Ill., etc., to St. Paul, Minneapolis and Minnesota Transfer, Minn. Rates: proposed—13.5c per 100 lb.

D-43-54. **Stone,** not carved, lettered, polished or traced, C. L., (See Note 3), but not less than 40,000 lb., from St. Paul, Minneapolis Transfer, Minn., to Mitchell, S. D. Rates: proposed—18c per 100 lb.

Southwestern

8021. Establish from Colbert, Okla., in cents per ton of 2000 lb., on **sand,** carload, minimum weight as per Item 60-A, S. W. L. Tariff 162-J, to expire December 31, 1936, not subject to emergency charges: To Ringgold and Rosson, Tex., 85c; to Walton and Henrietta, Tex., 90c.

8022 and 8115. To establish rate of 226c per ton of 2000 lb. on **silica sand,** in box cars, (See Note 2), from Hollow Rock, Bruceton and Lipe, Tenn., to Pine Bluff, Ark. To make rate on other **sand** 196c.

8151 and 8152. To establish on **asphalt coated stone,** carloads, (See Note 2), from Cape Girardeau and Marquette, Mo., to Mound City, Ill. 130c per net ton; to Harrisburg, Ill., 200c.

8157. To establish on **crushed stone and/or crushed marble,** carload, (See Note 2), but not less than 50,000 lb. from Canton City, Colo., the following rates in cents per ton of 2000 lb.; 500c to Tulsa, Norman, Claremore, Okla., 440c to Alva, Okla., and 460c to Weatherford and Edmond, Okla.

8195. To establish a rate of 50c per 100 lb., minimum weight 60,000 lb., on **oyster shells,** from producing points along the Gulf of Mexico, such at Pensacola, Fla., New Orleans, La., also Galveston, Houston, Matagorda, Palacios and Texas City, Tex., to Craig, Colo.

Texas-Louisiana

4936-TX. **Sand** from Liberty to Beaumont, Atreco, Magpetco, Port Arthur, Pt. Neches and Smith's Bluff, Tex., to cancel rates in Items 6880 and 6900 of Texas Lines' Tariff No. 2-M.

Illinois

8000-97-D. To cancel existing commodity rates on **crude or ground feldspar,** C. L., and **cornwall stone,** C. L., between points in I. R. C. territory, permitting Class 21 rates to apply.

4180-1. **Moulding sand,** C. L., (See Note 2), but not less than 40,000 lb., from Dallas City, Ill., to Dubuque, Ia. Proposed—$1.51 net ton.

7056-1. **Sand,** moulding, C. L., (See Note 3), from Greenville, Lutz Spur, Mulberry Grove, Ill., to Havana, Ill. Proposed—$1.60 per net ton.

8000-105. To establish Class 17½ on **firestone,** rough quarried, C. L., minimum weight 50,000 lb., between I. R. C. points.

8281. **Sand,** moulding, C. L., (See Note 3), but not less than 40,000 lb., from Metropolis, Ill., to Chicago and Kewanee, Ill. Proposed, $2.50 net ton.

I. C. C. Decisions

25675, Sand, Booth & Olson, Inc., vs. C. M. St. P. & P. By division 2. On further hearing determined that reparation of $954.40 with interest was due complainant under finding that the rate, Hawarden, Ia., to Canton, S. D., was unreasonable.

15843, Asphaltic Stone and paving materials from the south, embracing also applications Nos. 15857, 15889, 15892, 16017 and 16054. By division 2. Carriers for which Tilford and Pope are published agents authorized to establish rates from producing points in Kentucky on (a) asphaltic sandstone to destinations in southern, western trunk line, Illinois, central, New England and trunk line terrtories, (b) road-building material to destinations in southern territory and (c) bituminous asphalt rock to destinations in southwestern territory without observing the long-and-short-haul part of section 4 over their long routes. Authority is also granted to establish and maintain rates, asphaltic limestone, Margerum, Ala., to destinations in western trunk line territory.

15747. Ground Stone and Marl; also 15780, 15895, 15917, and 16075. By division 2. Official territory railroads having long lines authorized to establish rates equal to lowest that may be made over any line under the basis in American Lime & Stone Co. vs. Pennsylvania, 201 I. C. C. 467, without observing the long-and-short haul part of section 4 to various destinations, subject to the 33⅓, 50 and 70% circuity limitations.

15976. Stone. By division 2. Carriers authorized to establish rates, points in western New York to destinations on the Pittsburgh, Shawmut & Northern, without observing the long-and-short-haul part of section 4, subject to the 70% circuity limitation.

I.C.C. Decisions

26980. Talc. Hammermill Paper Co. vs. St. Johnsbury & Lake Champlain Railroad Co. et al. By division 2. Rate, carloads, Johnson, Vt., to Erie, Penn., unreasonable to the extent it exceeded 22.5% of 1st class on shipments made prior to December 13, 1933. Reparation awarded.

15447 and 15906, Roofing Slate, from New England. By division 2. Parties to Curlett's A-330, A-331, and A-338, and Van Ummersen's 160 and 200 authorized to establish on carloads, minimum 40,000 lb. over lines having relief with respect to class rates, points in New England and trunk line territories to destinations in central territory, including extended zone C in Wisconsin, the lowest rates that may be constructed over any route from and to the same points on the basis, over standard routes 1c higher than the rates from Bangor, Penn., and over differential routes, 1c lower than the rates over the standard route, and maintain higher rates to intermediate points in central territory.

27047, Crude Ground Talc, Sherwin-Williams Co. et al. vs. Baltimore & Ohio et al. By division 4. Rates, carloads, Emeryville, N. Y., to points in official territory, such as Chicago, Ill.; Kensington Station, Ill.; Cleveland and Dayton, O.; Detroit, Mich.; Lucaston and Newark, N. J., and Brooklyn, N. Y., unreasonable to the extent they exceeded 22.5% of the corresponding first class rates, minimum 60,000 lb. applicable when the shipments moved between November 12, 1932, and October 18, 1933. Reparation awarded

26566, Phosphate Rock, Michigan Fertilizer Co. vs. L. & N. et al. By the Commission. Dismissed. On reconsideration, finding in prior report that rate on phosphate rock, from Siglo, Tenn., to Lansing, Mich., was not and is not unreasonable, or unduly prejudicial prior to September 25, 1933, affirmed, but the finding that this rate was and is unduly prejudicial on and after that date, reversed. The new finding is that the rate was not and is not unreasonable.

Rates Reduced in Two States

The Arkansas Corporation Commission, in orders issued May 6, authorized the Frisco and Cotton Belt railroads to put into effect a rate of 70c per ton on sand and gravel hauled from Yarbro to Laird, Ark.

The Mississippi Railroad Commission, on May 6, ordered a reduction on gravel shipments from Hattiesburg to Bowie, Lux, Sanford, and Seminary, Miss., on request of the Illinois Central. The existing scale of 44 to 45c was reduced to between 30 and 40c. The state commission extended from May 17 to September 1 the rate of 45c a ton on carload shipments of sand and gravel from Avalon and Charleston to Glendora, Miss.

I.C.C. Upholds Tennessee Decision

The I.C.C., following appeal by 20 railroads, has upheld the refusal of the Tennessee Railroad and Public Utilities Commission to allow intrastate surcharges equal to interstate surcharges on phosphate rock, phosphatic sand, agricultural limestone and other major commodities. Among the Tennessee shippers who protested against the increase in surcharges were Hermitage Portland Cement Co. and T. L. Herbert & Sons.

Publications Received

Manual de Cemento Portland: the Compania General de Asfaltos y Portland "Asland," of Barcelona, Spain; 140 pages, well bound and printed on fine paper with gilt edges. The Asland company is much the largest manufacturer of cement in Spain and is among the largest anywhere, and its latest factory (in Cordoba) has a capacity for 3,000,000 bbl. annually. But this book is in no sense an advertisement of the company or its products, for it is a very complete treatise on the uses and manufacture of cement and the physics of concrete and concrete design. About 200 pages are given to the theory and practice of concrete mix design and discuss not only the work of Abrams but that of Feret and Bolomey, whose simple strength formula is now coming to be so much used. There is a good discussion of aggregates and the effect of different minerals on concrete strength, tables from Dyckerhoff's experiments illustrating the points brought out. From the same author are the tables of quantities for different mixes and the expected strengths. One section gives descriptions of and specifications for the cements used in Spain, including portland, high early strength, slag, pozzuolanic and super-cements. The one novelty mentioned is a cement called Zumaya, a natural cement made by calcining marl found at Zumaya with a lignite found with it. The ashes of the lignite have an important pozzuolanic effect. Some 30 pages are given to reinforced concrete, the data and criteria being from the German Commission's report of 1932. In the section on dams and other hydraulic work there is an excellent discussion of new types by Prof. Alfonso Pena Boeuf. Another article on dam and other important construction by José Nuñez Casquete gives the work in detail of designing a mix, combining the cement and aggregates according to Fuller's curve and testing mixes with varying amounts of cement (fine sand being substituted for cement in the lean mixes to keep the grading), and testing specimens for density as well as strength. Concrete and the Ethics of Construction is the heading of an interesting article by A. Ochoa de Retana. The latter third or so of the book is given to the theory and practice of manufacturing portland cement, the theory being largely based on the researches of Dyckerhoff, Bogue, Ashton, Jänecke and others about as well known. In this portion is a description of Spanish cement material deposits including the geology as well as the location and the nature of the material. There are many illustrations. Most of the construction shown is Spanish although there is a fair showing of new work in other countries. Now that architecture has become international there is a family resemblance of all the newer buildings, although there is a greater disposition in Europe to use the advantages of reinforced concrete than there is in the United States. Sections are rather lighter, hollow and pierced sections are more used and roofs are more often cantilevered. This work is important as evidence of the remarkable spirit of progress that has risen in Spain in the past ten years and the hopeful view of its citizens, a spirit that other nations may well desire.

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The Heat of Hydration of Portland Cement Pastes; by Wm. Lerch and R. H. Bogue. Paper No. 26, Portland Cement Association Fellowship at the National Bureau of Standards, Washington, D. C. An experimental test of hydration is carried through from beginning to end, with calculations of heat evolved on complete hydration compared with actual measurements, the effect of surface area on the rate of heat evolution, etc., coming in for consideration.

Rock Wool

Rock Wool from Illinois Mineral Resources. Bulletin 61, 262 pages, by J. E. Lamar, H. B. Willman, C. F. Fryling, W. h. Voskuil and other members on the staff of the Illinois Geological Survey. The use of mineral wool as an insulating material has increased greatly in the last 10 years owing to the expansion of markets for insulating materials. A search of the technical literature reveals only a meager amount of information as to methods of production or uses. There have been various references made to the subject in geological reports and other technical publications, but it is said that there has been no collection of general and detailed information on the subject until this Bulletin 61 was published by the Illinois Geological Survey.

The publication is in the form of a 262-page, paper-bound volume. Following a three-page introductory chapter giving a summary of the findings, the bulletin devotes 143 pages to detailed geological descriptions and discussions of those material formations in Illinois which are economically situated and mineralogically suitable for the manufacture of rock wool. Included is considerable discussion of areas not so well situated economically, and the deposits which may require additional fluxing materials. Part 3, including chapters 6 and 7, discusses laboratory experiments in testing Illinois materials for rock wool and the influence of operating variables on the technical processes of manufacture. Part 4 discusses the mineral economics of rock wool in its application, uses and markets. There are five appendices attached relating to various phases of the study as well as a bibliography of the technical literature on the subject.

While the bulletin is written for the purpose of presenting the availability of materials within the state of Illinois, it contains a vast amount of valuable information for anyone interested in the manufacture of rock wool. The authors have presented their subject in an interesting manner and have brought the subject up to date within the limits of their experiments.

Care and Operation of Air Compressors

According to
R. C. DEMARY
AKRON, OHIO

If You're an Average Operator, Here Are Some of the Things You Should Do for Your Compressors—and Don't

HAVING OCCASION to visit a great many power plants, a large number of which are in the stone, gravel and sand industries, it is surprising to note how many operators neglect the most important considerations for safe, efficient and economical operation.

In most instances compressed air plays a very important part, since it is used for the operation of rock drills, small hoists, and in some cases furnishing air for compressed-air locomotives.

Air Intake

One item of great importance, and one that is often overlooked, is the location of the air intake. If possible, the intake should be located on the north side of the building. This may seem to be of little importance, but generally the air at this point is a few degrees cooler than on the other sides, and the temperature of this intake air does make a considerable difference in the efficiency of the compressor as shown in the accompanying table.

AIR TEMPERATURE AND CAPACITY*

Initial temperature Degrees, Fahrenheit	Degrees, Absolute	Relative capacity and efficiency
20	481	1.083
30	491	1.061
32	493	1.058
40	501	1.040
50	511	1.020
60	521	1.000
70	531	0.980
80	541	0.961
90	551	0.944
100	561	0.928
110	571	0.912
120	581	0.896

Carry the intake pipe up at least 6 ft. above the ground and equip it with some reliable air filter. There are a number of different forms of filters which can be purchased ready to attach to the intake pipe. One that is in wide use consists of a box with a filter shell containing short brass tubes covered with viscosine. This filter gives good results with a negligible pressure drop and requires cleaning only once every six to ten weeks. Any filter which will clean the air can be, and should be used.

If the user desires to build his own filter, a good method is shown in the accompanying sketch. This consists of a wood frame covered with heavy wire screen of ½-in. mesh fastened to the inside of the frame, with removable frames covered with cheesecloth or some other similar fabric placed against the wire and so made that they can easily be removed for cleaning when necessary. A roof should be placed over the top of the intake frame to protect the screens from the weather.

*60 deg. F. is taken as basis of comparison.

Piping

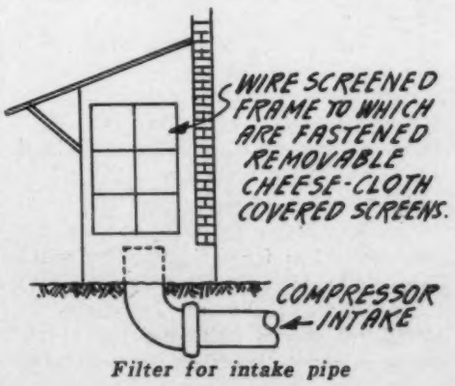
The intake pipe should have as few turns as possible. It should have an area at least 50% of the area of the air piston, and the longer it is, the greater the diameter. A safe rule is to increase the diameter 1 in. over the size of the compressor for each 10 ft. in length.

Many installations do not give the results they should because of faulty piping. A method giving good results and tending towards safety follows:

Air Receivers

Run the air discharge pipe from the compressor to the top of the receiver and with as few turns as possible. The main line from the receiver should be taken off about 12 or 14 in. from the bottom. A drain pipe with valve should be located in the bottom of the receiver for the purpose of blowing off the accumulation of moisture and sludge which collects. Be sure the receiver is equipped with a reliable pressure gage and pop valve. The receiver should also be raised and never be allowed to rest direct on the floor.

If two or more compressors discharge into a common receiver or pipe line, a gate valve should be placed on the pipe leading from each machine, so that it can be relieved from all pressure when not in operation. In such a case, however, it is necessary that a suitable pop safety valve be placed on the line between the valve and compressor, so that, should the latter be started, with the gate valve closed, no damage will result. This safety valve may be so arranged that it can be opened before starting the compressor in order to relieve the motor, if electrically driven, of excessive current load in starting.



Filter for intake pipe

Need of Good Cooling Water

To obtain the most efficient results from a compressor a proper supply of cooling water must be furnished to the jackets and intercooler. The amount of water required is from 1 to 1½ gal. for each 100 cu. ft. of free air, depending upon the initial temperature of the water. Do not put any valve on the discharge line. The end of the discharge pipe should be so located that it may be seen easily, and any stoppage of the flow of water through the jackets quickly noted. A good arrangement is to have the jacket outlet pipe discharge into a funnel located in the pipe for carrying off the water, leaving sufficient space between the two for observing the flow.

All water and air spaces where water is likely to accumulate should be provided with drain cocks, so that all water may be drained away when shutting down for any considerable time, especially in cold weather.

Moisture carried in the air, when deposited in the transmission pipe or in the ports and exhaust passages of the machinery using the air, will sometimes cause trouble by freezing. This condition can be avoided by installing an aftercooler or some suitable moisture remover apparatus as near as possible to the compressor and ahead of the receiver.

Lubrication Pointers

Lubrication of air compressors has been given considerable attention and the most satisfactory results can be obtained by using an oil that reduces the friction to a minimum and eliminates carbonization so far as possible.

For the reduction of friction, the oil chosen should have sufficient body to sustain the weight of the moving parts and to form a seal between the piston rings and the cylinder walls, and still not absorb excessive power in overcoming the viscosity of the oil itself.

Objections to air cylinder oils which al-

low more than the slight amount of carbonization that appears unavoidable, are, of course, well known.

This carbonization quality of an oil allows the accumulation of the deposits of carbon, which are sticky in the early stages of their formation, but hard and flinty later. Such deposits accumulate on the cylinder valves, in the cylinder passages, in the pipes and eventually in the receiver.

The formation of excessive carbon deposits is apt to be due to any one or more of the following causes:

(1) Ill-advised use of some oils which easily decompose by the heat of the air cylinder.

(2) Use of oils of too great a viscosity, often referred to as "heavy oils." These do not atomize readily and, therefore, remain too long on the cylinder walls, thus baking down to a sticky carbon deposit.

(3) Use of too great quantities of oil, which has the same effect as the use of too heavy an oil, so far as the carbonization is concerned.

(4) Failure to provide a proper screen over the air intake of the compressor, thus allowing entrance of dust and dirt (especially coal dust).

Objection to carbonization aside from the sticking of air valves and choking the air passages is the menace of explosion or fire. Small carbon particles may be torn loose and become incandescent from causes not anticipated by the compressor manufacturer. If these incandescent carbon particles come in contact with oil vapor an explosion or fire might result, causing heavy damage.

For average use the oil should be a medium bodied pure mineral oil of the highest quality and not compounded with any fixed oil such as animal or vegetable, and should be carefully filtered in the final process of manufacture.

Primarily a distinction must be made between those oils having a paraffin base and those having an asphaltic base. Each is claimed to be the more desirable by its respective manufacturers and naturally each has its followers.

Removal of Carbon

This much is certain, the carbon formed by oils with a paraffin base is very adhesive, and is characterized by a hard, flinty nature. The carbon formed by oils with an asphalt base is light and fluffy and is easily cleaned out. Thus the operator can draw his own conclusions. Either oil will, however, deposit enough carbon in the system to necessitate periodic cleaning.

For the removal of carbon deposits the operator should confine himself to the use of soap suds. The best cleaning solution is made from one part soft soap to 12 parts water. This should be fed into the air cylinders about once every two weeks, either by means of a small hand pump or through a regular lubricator at a rate about ten times as rapid as that of the oil; and it should take the place of the oil for a few hours each time it is used.

The cleanliness of the air valves should be determined by inspection periodically, and such inspection will indicate whether more or less soap suds should be used. After using the soap open the drain cock on the air receiver and intercooler, in the case of compound machines, and draw off all accumulated water. Oil should always be used for at least an hour before shutting down the machine, and after using the soap solution to prevent the formation of any rust. Never, under any consideration, use kerosene or any of the similar oils in an air cylinder for any purpose whatever because of their volatile nature.

When the operator of an air compressor succeeds in obtaining a lubricating oil that is giving perfect satisfaction, he should be cautious about changing to other grades, particularly if cheapening the cost is advocated by the purchasing agent or sales agent. If, however, a change is decided on, the performance of the new oil should be most carefully checked before damage results and to see that no increased amounts of carbon deposits collect on the inside walls of the receiver.

The most satisfactory way to get good lubricating results is to seek the advice of some reputable lubricating company and be governed by their experience and recommendations, which, however, should be based on the foregoing statements.

Successful Regional Safety Meetings

THE PORTLAND CEMENT ASSOCIATION opened its ninth annual series of regional safety meetings on February 18 with a meeting at Chattanooga and followed up with a program of meetings throughout the United States east of the Rockies, completed the latter part of May.

The program offered at this year's regional meetings is unique in several respects. A considerable portion of both morning and afternoon sessions is given over to "panel" discussions, where four or five practical operating men discuss the assigned subjects partly from prepared outlines but largely extemporaneously. In most of these cases the entire assemblage finally joins into the discussion.

One of the most popular panel features is entitled "What Would You Do With These Accidents?", in which a number of the most severe accidents suffered by the industry during recent months are carefully described and considered from every angle.

Luncheon sessions are devoted entirely to the subject of highway safety, many of the meetings held so far having been addressed by directors of the various state highway police. The U. S. Bureau of Mines is cooperating vigorously with the series, the following safety engineers of its staff being assigned to the various meetings: J. J. Forbes (supervising engineer), C. A. Herbert, C. A. Cash, Claude Dempsey, J. B. Hynal, A. U. Miller, R. D. Currie, W. H. Tomlinson.

Old Quarries Reopened

Prescott, Ariz.: Old limestone quarries in the Pinedale, Linden and Snowflake districts, opened in 1875 by the first Mormon settlers, have been reopened and are being operated by WPA.

New Plant

Charles Maggard, Canton Fuel Co., Canton, Ohio, is building a rock-crushing plant five miles from the city. Agricultural limestone will be one of the principal products.

Bankruptcy Suit

Nugent Sand Co., Louisville, Ky., was named in an involuntary petition in bankruptcy in the federal district court at Louisville recently. The petitioners, including William F. Nugent, allege the company is insolvent and committed an act of bankruptcy by transferring a portion of its property to the Citizens-Union National Bank.

Rock Wool Plant

Seneca Rock Wool Co., Tiffin, Ohio, has announced plans to build a plant to make rock wool by a new process. I. B. Engle and Karl Heilman, of Tiffin, are the principals.

Buys Chicago Quarry

Materials Service Corp., Chicago, Ill., has announced the purchase of the Stearns Lime & Stone Co., Chicago, Ill. The quarry and plant of this company is at 27th and South Halsted St. and is probably the oldest active quarry operation in Chicago territory. There are six lime kilns of ancient design, recently somewhat modernized.

Production Booming

Roche Harbor Lime Co., Seattle, Wash., is reported to be operating its Roche Harbor plant at a greater percentage of capacity than at any time since 1907—eight kilns are in production turning out 1500 bbl. of lime per day. The company for years has owned a limestone deposit at West Sound, on Orcas Island, and will start mining operations there in June. A dock will be built and a large crew employed to care for this new development. The company ships lime to all parts of the world as well as to Pacific Coast and interior states. Started 50 years ago by John S. McMillin, who pioneered the development, active management now has been turned over to his son, Paul, a graduate of the University of Washington.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

They *Built a* CONCRETE PROSPERITY *out of CONCRETE* BRICKS

And their materials were left-over aggregates . . . HOW a Concrete Brick effort—begun as a side line—promises to become a full-time business

By Bror Nordberg,
Associate Editor, Rock Products

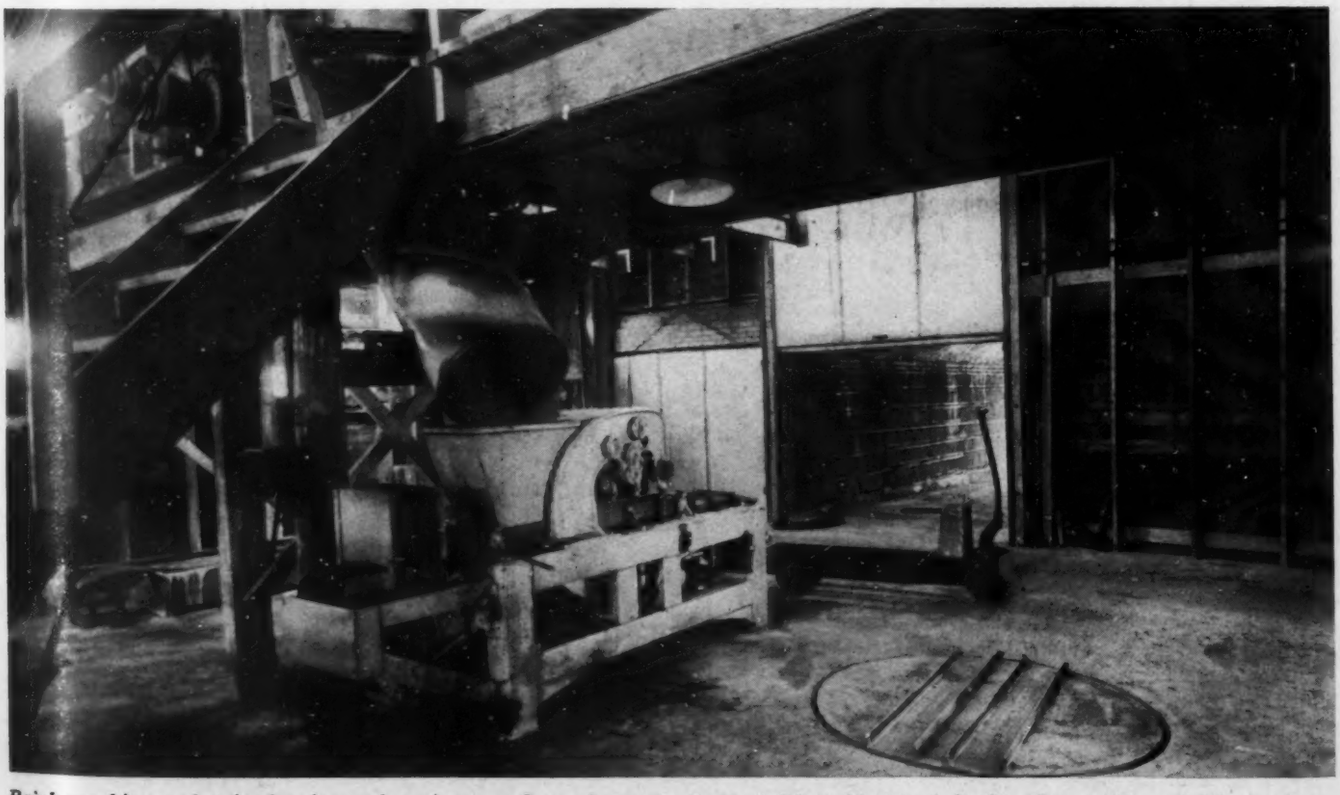
MANY SAND AND GRAVEL OPERATORS have a surplus of certain sizes of aggregate, usually the smaller sizes of coarse aggregate—material not readily salable, but which costs money to get out with the coarser product. These represent a considerable tie-up in capital and sometimes accumulate in such quantities that normal operations are hampered.

Officials of the Riverside Sand and Gravel Co., Inc., Thiensville, Wis., recognized possibilities of a good profit in building products made from such materials, and the Riverside Dunbrik Co. was organized late in 1935 to manufacture concrete brick.

John A. Krause and Walter Richter, secretary-treasurer and vice-president, respectively, of the Riverside Sand and Gravel Co., Inc., Walter Wahner, A. J. De Swarte and Hugo Laabs are the chief stockholders of the Riverside Dunbrik Co. Mr. Krause is president and serves as plant manager, dividing his time between the two plants.

Aggregate Plant

The sand and gravel plant is an 8-in. suction dredging operation, working a deposit



Brick machine under feeder from the mixer on floor above at plant of Riverside Dunbrik Co. Turn table and lift truck are at right

New concrete brick plant. Note stockpile of torpedo sand

containing a considerable proportion of the smaller aggregate and fines, the percentage depending on where the dredge is operating in the pit. Considerable of the company's business is for masons' and plasterers' sands, either of which can be pumped in excess by operating at different locations in the deposit.

When orders are running heavy for these sizes, there will not be an excess of either, but certain other sizes of fines necessarily are stockpiled even when these sizes are being run. When the plant is operating, as many as nine different gradings of sand are stockpiled from the flume, which collects the sand in pockets at definite intervals along its length. The 100-cu. yd. hourly output of the plant necessarily furnishes much sand which must be stockpiled. Operations are sometimes hampered by abnormally large stockpiles, especially when large gravel is being run. For example, to fill an order for 34,000 cu. yd. of large gravel some time ago, it was necessary to stockpile approximately 20,000 cu. yd. of torpedo sand (¼-in. minus).

The fact that an overabundance of such ideal fine aggregate was always conveniently available was one of the reasons for the venture into the concrete brick business. The location of the aggregate plant is within easy trucking range of Milwaukee, a city just now enjoying a vastly stimulated building recovery. Consideration was given to the fact that Milwaukee is served by only a few small local clay brick plants and that most of the competitive brick are shipped from Streator, Ill.

The Riverside Sand and Gravel Co. is located in a section of the country subject to severe climatic conditions, necessitating shut-downs of the dredge during the winter months. Company officials looked upon the new venture as being an excellent way to keep busy during these winter months, as well as opening up new possibilities for profits.

The location of the "Dunbrik" plant with reference to the sand and gravel operation was considered of importance before the decision was made to manufacture concrete brick. It was considered a financial advantage to haul the finished product (brick) to Milwaukee 12 miles away rather than to locate the plant in the city and haul the aggregates to the plant.

The Brick Plant

Construction of the brick plant was begun in November, 1935, and operation began in March of this year. Prospects of selling concrete brick in competition with clay brick were so favorable that a complete up-to-date plant was built. The building was located at the extreme end of the fines stockpiles, so that material would be readily accessible.

The plant is a one-story structure, 42x40 ft. in plan, with a concrete floor. Two curing kilns, 8 ft. 6 in. wide by 40 ft. long, were built of 8x12-in. Dunstone, manufactured on the new commercial line production Dunbrik machine.

Equipment

The plant itself was designed by the W. E. Dunn Manufacturing Co. The operating unit consists of the automatic Dunbrik machine with an output of 1800 brick hourly, a 16-cu. ft. Dunn shovel mixer and Dunn automatic loading equipment. The loading equipment consists of a roller track and a ½-cu. yd. bucket, operating through a cable and sheaves, and is controlled automatically with a single lever operated by the man loading the bucket.

Handling the Aggregate

Only torpedo sand (¼-in. minus) is graded and used for the brick. A two-speed Kern hoist and a 1-cu. yd. dragline handle the sand and move it further from the aggregate plant toward the brick plant as it accumulates.

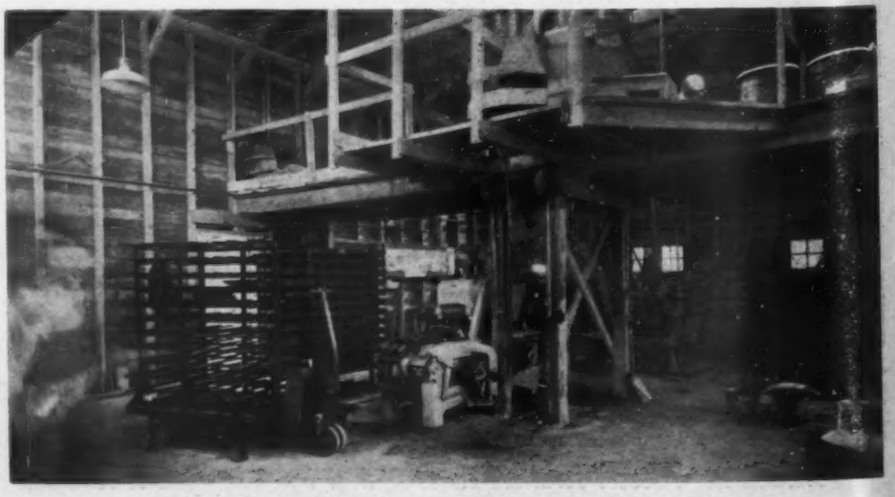
This same dragline has the added function of making the proper gradations for the sand to be used for brick manufacture. The bucket takes approximately correct proportions of ¼-in. to ⅜-in., ⅜-in. to 0 sand, etc., from the various piles and dumps it into the large pile adjacent to the brick plant.

At present, one of the regular trucks of the sand and gravel company hauls the sand the short distance into the brick plant, where it is dumped near the bucket feeding the mixer. The only equipment needed to handle the sand from the stockpile to the brick plant is a small conveyor, which will displace the truck as business progresses.

Operation

Four men are employed to handle all plant operations. One man loads the sand, cement and coloring (for face brick) in correct proportions into the Dunn bucket set below the floor line. This man automatically controls the elevating of the dry materials up the roller track to the mixer, set above the Dunbrik machine, by a single lever control. The water valve and dial measurer are conveniently located, where this man can easily control the flow of water. The hand on the dial measures to a tenth of a gallon the exact amount of water passing through the pipe leading to the mixer, where it is sprayed into the batch.

After the bucket discharges the dry aggregate into the mixer, it automatically returns to its original position, ready for another load. The Dunn shovel mixer is designed to



Brick racks, brick machine, mixer, and elevating equipment

turn, stir and stroke the mix at each revolution of the mixing drum. After mixing with water, the concrete is delivered by gravity to the Dunbrik machine.

Mix

The proportions of cement to aggregate are 1:7 by volume, and finer sand is used where light color brick is to be made. The sand used is practically clay-free, sharp and angular, weighing 3010 lb. per cu. yd. The sand averages about 2½% moisture. On an average, 3 gal. of water is used to every 15 cu. ft. of mix.

Two men are kept busy taking the finished brick and placing them on racks for curing. Fifteen steel racks, each capable of holding 576 bricks, manufactured by the Lakeside Bridge Steel Co. (Milwaukee), are used for storing of brick in the curing rooms. A Lewis-Shepard 3500 lb. capacity hydraulic lift truck is used to move the racks to and from the kilns. Each empty rack is set on a revolving 5-ft. diameter turntable in front of the machine, to enable moving of the rack without the truck.

Curing

Each of the two curing rooms has a capacity of 9200 brick. A 20-hp. boiler is used to supply steam for year-around steam-curing. Low-pressure steam (5 to 20 lb.) is released in the kilns through perforations in a 1-in. pipe. All brick are steam-cured for 12 hours, after which they are water-cured for 14 days.

Enough orders have already been filled to indicate that there will be a demand for these brick far in excess of early predictions. The company is operating 7 hours daily to build up a stock of ½ million brick, which will be maintained at all times. Already 150,000 brick, common and face, have been stockpiled. When face brick is being run, mineral oxides manufactured by Ricketson Mineral Color Works (Milwaukee) are added to the bucket in the proper proportions to give the desired color.

Power

Power consumption of the plant is unusually low. A 3-hp. G.-E. motor drives the Dunbrik machine, and a 7½-hp. G.-E. drives the elevating equipment and mixer.

Officials of the company at first looked upon the brick business as a good winter sideline to keep the men busy, but already they are predicting a 360-days-a-year operation. Plans have been made for an extensive advertising program, and a salesman is contacting contractors and builders direct.

Other manufacturers of concrete brick locally have been unable to manufacture brick at the price of the Riverside Dunbrik Co. and are buying Dunbrik for resale to their customers. Brick are being sold strictly on a quality basis and common brick are being sold *at a profit* at a price equal to that of the cheapest common clay brick. Face brick can be manufactured in any color desired to compete favorably with clay face brick. The Riverside Dunbrik Co. is operating under a franchise issued by the W. E. Dunn Manufacturing Co.

Portland Cement Pavement Yardage

AWARDS of concrete pavement for April, 1936, were announced by the Portland Cement Association as follows:

	Sq. yd. awarded during April, 1936	Total sq. yd. for year to date, May 2, 1936
Roads	2,766,946	6,958,574
Streets	1,047,411	3,772,776
Alleys	20,243	83,903
	3,834,600	10,815,253

New Use for Electricity

Harrison Concrete Pipe Co., Tacoma, Wash., has developed a new and unique use for electrical power. Three concrete pipe curing kilns have been built. These three kilns are arranged side by side with two 10-kilowatt electric evaporating tanks located on the inside partitions between the kilns. These tanks are so arranged that each may be used for supplying steam, or water vapor, to either or both of the adjacent kilns.

Power for operating the electric kilns is supplied by the city of Tacoma under the regular power rate and the electric power requirements of this pipe manufacturing plant, exclusive of heating, are such that while the connected load is high the amount of energy used is small. The electric evaporators are connected to a double throw switch in such a manner that the electric heaters cannot be used when pipe manufacturing is in progress. Thus, while the connected load of the pipe plant is about the same as that of the electric evaporators, both services are never on at the same time, and the demand charge is limited to that required by the manufacturing plant.

To Process Vermiculite

Industrial Minerals Corp. of America, Buffalo, N. Y., operating non-metallic mineral properties in North Carolina, New Mexico and other points, plans new one and multi-story milling plant on Buffalo waterfront for production of a new building product, using vermiculite as raw material. Crushing, grinding, sorting and other equipment will be installed. The investment will be about $100,000. Vermiculite is a species of mica which upon roasting breaks up into fluffy, lightweight particles. It is sold for insulation, for acoustic plasters, etc., under several trade names. The known deposits are in Montana, Colorado and North Carolina.

More Glass Wool

Owens Illinois Glass Co., Newark, Ohio, is planning to spend $2,000,000 expanding its facilities to manufacture glass wool and other industrial products of glass.

Will Use Suction Dredges

General Phosphate Corp., Beaufort, S. C., which has received exclusive mining rights by the South Carolina State Phosphate Board to all of that area contained in a triangle of which the Atlantic ocean is the base and the Broad and Coosaw rivers the sides, will use suction dredges to excavate the phosphate deposits. This will permit deeper operations than were possible in the old days when dipper dredges were used. The new plant will be specially built on plans drawn by Charles V. Boykin, president, Charleston Dry-Dock and Shipbuilding Co., Charleston; the washing and crushing plant will be mounted on dredge proper.

Expect Big Increase

RESIDENTIAL CONSTRUCTION throughout the country should show a 100% increase in 1936 over 1935, a national survey taken by the Investment Bankers' Association of America revealed.

The report said outlook for real estate and real estate securities is the brightest in several years.

A decided advance in suburban residential property was expected, "given an increase of promotion from 10 to 15% in general business activity, continuance of easy money and no material changes in real estate taxes."

Rebuilding Burned Plant

Jumbo Plaster and Cement Co., Sigurd, Utah, has obtained a loan of $75,000 from the Reconstruction Finance Corporation, of which $65 000 will be used to rebuild and equip the gypsum plant destroyed by fire in 1932. W. P. Payne is president and general manager.

New Plant

United States Gypsum Co., Chicago, Ill., is about to start construction of a new Sheetrock and Rock-Lath plant at Heath, Mont., where hitherto only gypsum plasters have been made. The wall-board manufacturing building will be 400 ft. long and from 40 to 60 ft. wide. The capacity of the new plant is estimated at 35,000 sq. ft. per day. O. M. Newsome is superintendent at Heath; K. R. Seckrote is works manager there.

Damaged by Fire

National Gypsum Co., Buffalo, N. Y., suffered a loss estimated at $30,000 in the destruction by fire on May 14 of the retarder plant at its Fort Dodge, Ia., operation. The loss was covered by insurance.

Production Picking Up

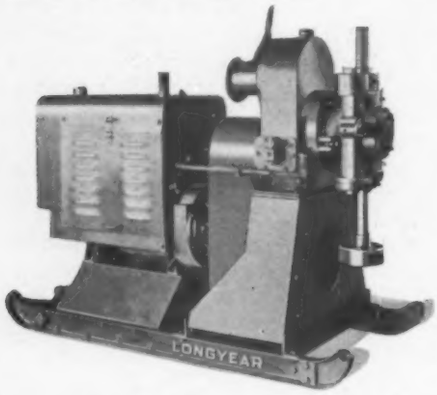
Kentucky Rock Asphalt Co., Bowling Green, Ky., is reported as having produced 4200 tons the first week in May, and to be hitting a stride of about 1000 tons per day. The plant had been shut down for several months.

New Machinery and Equipment

Small Core Drill

E. J. LONGYEAR CO., Minneapolis, Minn., has designed what is termed a Junior Scout drill, designed for core-drilling after the ledge is reached. It is said to carry a 3-in. casing through 100 ft. of overburden, and to have a rated capacity of 500 ft. of core-drilling, recovering a ⅞-in. diameter core.

Power is furnished by a 10¾-hp. gasoline engine, or by an electric motor, or a steam engine. Mounting is on a welded steel frame, resting on angle skids.



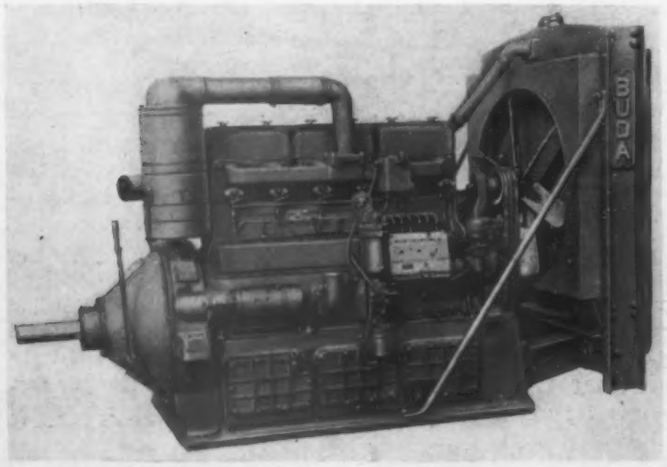
Core drill for use at ledge

Diesel Engine

THE BUDA CO., Harvey, Ill., announces a new Buda Lanova Diesel power unit Model 6LD—909, which employs an unusual type of cylinder head, resulting in "soft combustion," attained through increased turbulence and controlled combustion. This is accomplished principally through the use of an auxiliary air chamber, which, because of its function, is called the "energy cell."

The rate of pressure rise is said to be well within the limits of gasoline engine practice; maximum pressures are not over 625 lb. per sq. in. The compression ratio is also said to be comparable to that of a gasoline engine, being 12.5 to 1 and 13.2 to 1. The special controlled turbulence feature is claimed to develop a high workable mean effective pressure, which in most Diesels is obtained only by high combustion pressure.

The 909 illustrated is a 6-cylinder, 4-cycle, solid injection engine with a 5½-in. bore and 7-in. stroke, 909 cu. in. displacement, developing 178 hp. at 1500 r.p.m. and 156 hp. at 1200 r.p.m. It is especially recommended by its manufacturers for industrial uses on construction equipment.



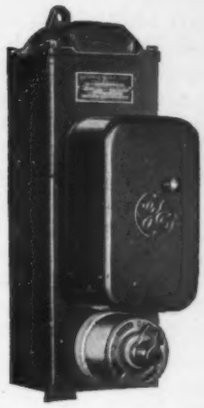
Diesel power unit employing unusual cylinder head

Transformer Speed Regulators for Capacitor Motors

A NEW LINE of manually operated transformer speed regulators for high-phase and low-torque capacitor motors, with and without full-voltage starting for single-phase and polyphase fan motors, has been introduced by the General Electric Co., Schenectady, N. Y. The units consist of a tapped autotransformer and a snap switch, and, for providing full-voltage starting, a relay which affords automatic transfer to the desired running position. With special additions, the regulators are available for reversing service as well as for operation from external sources such as thermostats in an air-conditioning system.

The snap switch provides for three speed positions, and other low speeds may be obtained from the autotransformer through reconnection of the transformer taps to the snap switch, giving a total of seven reduced speeds.

The regulators are for single-phase motors, rated up to two horsepower and for polyphase motors rated up to five horsepower. The polyphase regulator combines two auto-transformers connected in open delta, with a rotating snap switch mounted on a sleeve between the transformer cores. For reversing service, either polyphase or single-phase, an additional snap switch is mounted adjacent to the line switch.



Manually-operated speed regulator

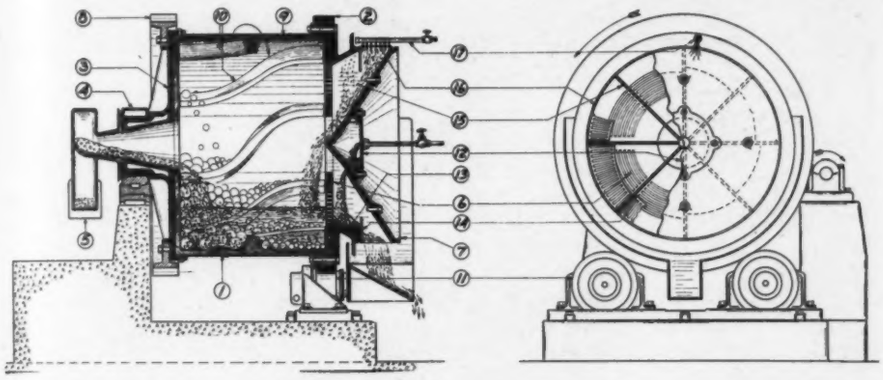
New Grapple

THE OWEN BUCKET CO., Cleveland, Ohio, announces Type "RA Grapple," the most distinguishing feature of which, as compared with the 4-tine grapple of conventional design, is the independent action of its tines. Instead of moving simultaneously toward the center in closing, any tine is capable of acting independently of the other three tines. This patented action, obtained by combining toggle operated tines and arm-controlled tines, causes all four tines to grip any stone regardless of its shape, with practically equal pressure, it is claimed. Grapples with capacities from 3 to 60 tons are manufactured.

Grapple with independently moving tines

Wet Grinding Mill

STRAUB MANUFACTURING CO., Oakland, Calif., makers of various types of mining machinery, are introducing to the rock products industry the "Rib-Cone" screening mill, as well as classifiers of familiar types. The Rib-Cone mill is illustrated herewith. The feed is picked up by the scoop (5) at each revolution and introduced into the grinding chamber through the tapered feed throat. The heavy shell liners, with their integral spiral ribs (10) perform the dual function of elevating the grinding balls to a maximum height and plowing the balls and coarse material back to the feed end of the mill. This circulating effect is designed to insure the rapid passage of the finely ground material through the annular slots in the discharge grid (6), which separates the grinding section from the screening section. Having entered the screening section, the pulp is diluted and the "fines" washed through the screen (16) which completely encircles this part of the mill. The small amount of oversize remaining on the screen (16) is elevated by the radial webs (15) which divide the screening section into compartments and then slides down the cone through the central opening in the grid back into the grinding chamber.



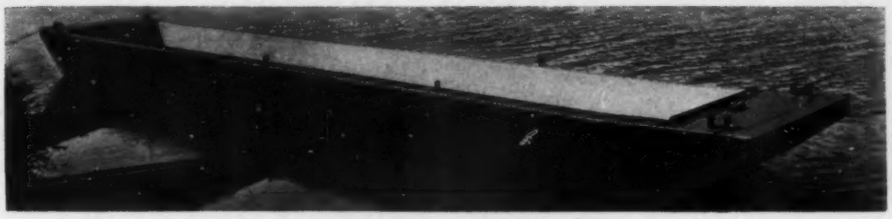
Screening mill for wet grinding

Here the returned oversize is intimately mixed with the partially ground material in the grinding chamber and again plowed back by the spiral rib liners to the feed end to repeat the cycle.

Some of the mill feed water is directed through the screen by the spray pipe (17). This reverse current is designed to keep the screen openings perfectly clear.

Dragline

THE MARION STEAM SHOVEL CO., Marion, Ohio, has produced a dragline with an extra long working range in 2½- and 3-cu. yd. capacities; it is known as Clutch Type 39-A. It is designed to handle a 2½-yd. bucket on an 85-ft. boom, and a 3-yd. bucket on an 80-ft. boom. Other features claimed are hook rollers to relieve center pin stress, anti-friction bearings throughout, all-welded underframe construction of a new type. It is claimed one of these machines with a 2½-yd. bucket can handle 2000 cu. yd. per 8-hr. shift.



New barge of arc-welded steel

Arc-Welded Barge

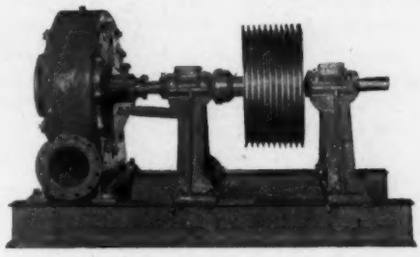
THE DRAVO CONTRACTING CO., Pittsburgh, Penn., recently completed an arc-welded steel barge 175 ft. over all, 26 ft. beam, 10 ft. 8 in. deep, having a capacity, fully loaded from 850 to 1000 tons (of coal). The draft is only 1 ft. 3¼ in. The shielded arc process of electric welding (Lincoln Electric Co.), was employed.

Sixtieth Anniversary

BRODERICK & BASCOM ROPE CO., St. Louis, Mo., is this year celebrating its 60th birthday —having been the first wire rope manufacturing concern west of the Allegheny Mountains. The May issue of its *The Yellow Strand* contains many interesting pictures of then and now.

V-Belt Driven Pump

KANSAS CITY HAY PRESS CO., Kansas City, Mo., has recently built a 10-in. dredge pump for Morrison, Glascock & Connor, which is interestng because of its V-belt drive. Power is supplied by a twin 250-hp. marine engine.

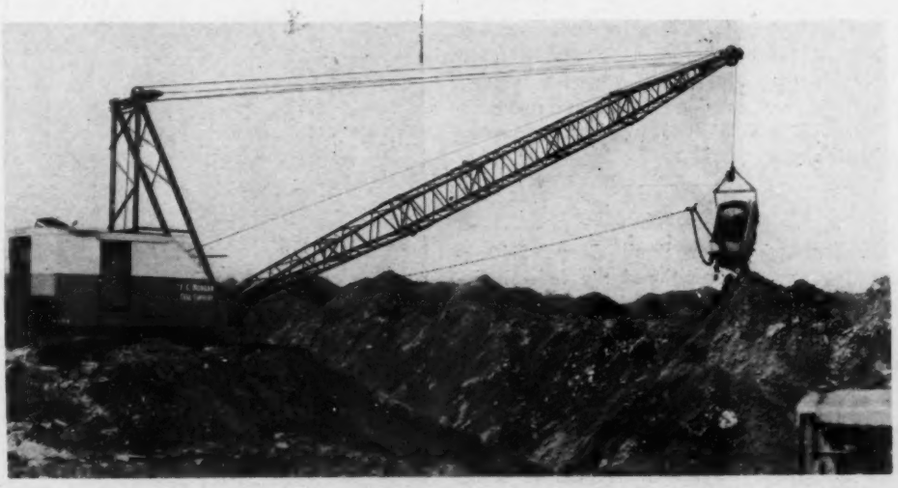


Dredge pump having V-belt drive

Finds Serious Silicosis Hazard

SIXTY PER CENT of the 4,406 persons employed in 103 western North Carolina industries surveyed by the State Department of Health were found to be exposed to silicosis dust hazards, Dr. Carl V. Reynolds, State Health Officer, has announced.

Dr. Reynolds said that more than 75 per cent of workers in granite, mica, feldspar, talc and asbestos industries are exposed. A clinical and X-ray examination of all employes in "dusty" industries will be conducted, he said.



A long working range distinguishes new dragline

California Compensation Rates Increased to Cover Silicosis

WORKMEN'S COMPENSATION INSURANCE RATES on pneumonoconiosis risks (which include silicosis) as existing in some 63 classifications of employment have been revised upward by Samuel L. Carpenter, Jr., California insurance commissioner, and became effective June 1. The rates are published on the basis of a surcharge or an additional rate than called for in the manual and vary in accordance with the industry involved, with increases ranging from approximately 0.03 to 198%, or from 34 cents to $5.61 per $100 of payroll. The rate order, however, carries with it a schedule rating plan allowing employers reductions in insurance costs up to 50% of the rate for adoption of approved safety measures and equipment. According to Mr. Carpenter, the new rates are less than one-half of the rates allowed in New York for the occupational disease hazards and about one-third of rates in many other states of the Union.

The rates promulgated by the commissioner more than cut in half the surcharges as proposed by the California Inspection Rating Bureau, which organization represents the insurance carriers writing the occupational disease risk business. As proposed by the bureau the surcharges asked ranged from 98 cents to as high as $19.60.

Commenting on the new rate schedule, Mr. Carpenter said that California loss experience in dust hazards has been exceptionally good in comparison with other states reviewed by him, which accounts for the moderate rates and liberal rating plan approved.

As a part of the insurance commissioner's ruling it is stated that the present rates are not designed to recompense the insurance carriers for any past losses.

Mr. Carpenter has instructed the California Inspection Rating Bureau to immediately prepare and present for his approval revised basic manual rates applicable to the classifications upon which a surcharge rate is approved.

The aggregate of the manual rate and surcharge for every $100 of payroll under the order will be $9.71 for surface mining, against $9.15 previously; underground mining, $13.21, against $11, and ore mining, $4.24, against $3.05.

To Reorganize

Allegheny River Sand Corp., Kittanning, Penn., has petitioned the federal district court at Pittsburgh for permission to reorganize under 77-B.

To Make Black Top

Webber Construction Co., Grand Rapids, Mich., is building a plant near the pit of the Grand Rapids Gravel Co. to make Col-Provia asphalt paving mixtures.

No Common Law Silicosis Suits in Illinois

INDUSTRIAL WORKERS who allege they contracted occupational diseases may not receive compensation through suits at common law, the Illinois State Supreme Court held recently, an affirmation action of the Lake County Circuit Court in dismissing the suit of Anton Vogel against the Johns-Manville Products Corp. Vogel sought to collect $2,950 on a contention that he suffered silicosis through breathing dust in the corporation's factory.

The court in another opinion reaffirmed its previous ruling holding sections of the occupational disease act unconstitutional. It affirmed the Cook County Circuit Court's dismissal of the case of Howard McCreery, who sought to collect compensation from the Libbey-Owens-Ford Glass Co.

New Plant

Tupelo Sand and Gravel Co., Tupelo, Miss., has begun operation under managership of D. Nash. The company is owned by Thomas J. Cole, president, Security Bank, Amory, and Peter M. Hollis, sand and gravel producer, Amory.

Saved from Death

Modern Sand and Gravel Co., St. Louis, Mo., came near having one of those common bin fatalities on April 29 when an oiler entered an opening in a loading station to clear a stoppage and was covered with sand shifted from a large pile. As he clung to the side of the opening, fellow workmen placed a steel cylinder around his head, to prevent suffocation, and called firemen and the police emergency truck. Ropes were passed under his armpits and he was dragged to safety.

Photo by St. Louis Post-Dispatch

St. Louis, Mo., police and firemen save workman from burial alive in a sand plant bin

THE INDUSTRY

New Incorporations

Mineral Products Corp., St. Louis, Mo. Incorporators are John M. Kreider and Charles Wright.

Yakima Sand and Gravel Co., Yakima, Wash.; $25,000. Incorporators are Leo S. Ross, Irvine Longbottom and Grover Burrows.

Bianchi Cement Stone Co., Quincy, Mass.; $10,000—100 shares of $100 each. Incorporators are Charles Predario, Stephen Bianchi and Helen Predario.

Asphaltic Concrete Co., 309 Park Place, Plainfield, N. J.; authorized capitalization, $10,000. Incorporators are Joseph F. Bruke, Allen Snyder and Richard E. Hefler.

Penokee Granite Co., Ashland, Wis.; to deal in stone and granite; 100 shares at $50 each. Incorporators are Gust A. Larson, Carl G. Westring, and Frank Asplund.

Northeastern Crushed Stone Co., Inc., Dracut, Pelham, N. H.; road construction; capital, $35,000—350 shares of $100 each. Incorporators are Pacifico J. Vallera, Anna Louise Pallotto and Antonio Pallotto.

Quality Earth, Inc., Epley Bluff, Ala.; to develop fuller's earth deposits in Clarke county, Ala., on Tombigbee River. M. J. Epley of Hotel Harrington, Washington, D. C., is president. A $50,000 plant will be installed.

Personals

A. T. Wood, general manager of the Green Bag Cement Co., Kenova, W. Va., has been elected president of the Huntington Manufacturers' Club.

Robert W. Wilson, superintendent of the Arlington, Ohio, plant of National Lime and Stone Co., has been transferred to the company's plant at Marion, Ohio.

Luis Elek, who has served as engineer for "La Tolteca" Cia. de Cemento Portland, S. A., at Mexico City, has been transferred to the company's plant at Tolteca, Hidalgo, Mexico, as general superintendent.

L. A. Wagner, inventor of the Wagner turbidimeter and formerly connected with the National Bureau of Standards, has joined Missouri Portland Cement Co., St. Louis, Mo., as research chemist.

Bernard A. McKinney, general manager, West Roxbury Trap Rock Co., West Roxbury, Mass., was tendered a testimonial dinner by a group of his competitors, in Boston, May 21. About 100 persons, including most of the producers in the area, were present.

Henry E. Rodes, president of the National Crushed Stone Association and head of the Franklin Limestone Co., Nashville, Tenn., gave a talk before the Engineering Association of Nashville May 18 on "Aims and Activities of the National Crushed Stone Association and What They Mean to Engineers."

Thomas Robins, Jr., whom members of the National Crushed Stone Association will remember as active in the Manufacturers' Division of the Association for a number of years as advertising manager and later as assistant sales manager of Robins Conveying Belt Co., was recently elected president of Hewitt Rubber Corp., Buffalo, N. Y. Mr. Robins is a graduate of Princeton University and was an officer in the Navy during the war. He has been with the Hewitt Rubber Corp., which is affiliated with the Robins Conveying Belt Co., for several years as assistant to the president, vice-president and general manager. Other officers elected were **F. G. Cooban,** vice-president; **E. K. Twombly,** vice-president and treasurer, and **J. H. Hayden,** secretary.

Obituaries

William Palmer, 62, superintendent of the Fredonia, Kan., plant of Consolidated Portland Cement Co., died May 3 at Chanute, Kan. He had joined the plant in 1909, when it was the Fredonia Portland Cement Co., as yard foreman, becoming superintendent in 1918.

J. C. Van Doorn, Minneapolis, Minn., former sales manager, Universal Atlas Cement Co., died May 13. He began his work with the company in 1903 as sales agent in St. Louis. In 1907 he became sales manager at Minneapolis, which position he held until last October, when he retired.

Thomas Robins, Jr.

Leonard Bishton-Botfield, 55, president of both Botfield Refractories Co. and the Canadian Botfield Refractories Co., Ltd., died May 5 at Philadelphia, Penn. Affiliated with the refractories industry for many years, he was responsible for numerous developments in the manufacture of high temperature cements. He was national chairman of the High Temperature Bonding Mortar Division of the American Refractories Institute and also a director of the Institute.

Charles A. Homer, Sr., 70, vice-president of the Missouri Portland Cement Co., died suddenly May 6 of acute indigestion at his home in University City, Mo. A native of St. Louis, he began his connection with the old Union Sand Co., predecessor of the Missouri Portland Cement Co., in 1903, as a salesman. He later became secretary and then vice-president. Surviving are his wife and a son, Charles A. Homer, Jr., a salesman for the Missouri Portland Cement Co.

J. H. Williams, Ocala, Fla., died May 6 in Perry, Ga. In bad health for some time, he was nevertheless active till the end and was in Perry on business when stricken. Early in life, he was superintendent of the Dutton Phosphate Co. mines at Juliette, Fla. At the time of his death, Mr. Williams was president of the Commercial Lime Co.; president of Georgia Lime Rock Co.; secretary-treasurer of the Dixie Lime Products Co.; and with his son was district distributor for the Sun Oil Co., doing business as J. H. and C. C. Williams.

Maj. Gen. Sir Philip Nash, 60, vice-chairman of the Associated Portland Cement Manufacturers, Ltd., and of the British Portland Cement Manufacturers, Ltd., of England, died in London, May 1. He served as British inspector-general of transportation on the Western Front in 1918, and from 1919 to 1921 he was director general of traffic, Ministry of Transport. He was an associate of the Institute of Electrical Engineers and a member of the Institution of Civil Engineers, the Institution of Mechanical Engineers and the Institute of Transport.

Gideon L. Austin, 61, prominent figure in the cement industry, who retired five years ago, died at his home in Bellefontaine, Ohio, April 21. Beginning as a worker in the Buckeye Portland Cement Co. at the age of 15, Mr. Austin worked up to plant manager. Here he manufactured cement which was used in what is believed to be the first cement highway in the country—around Logan County Courthouse, near Marl City, Ohio. He worked with cement companies in Michigan and served as manager of a cement plant at Chewelah, Wash. He was for a time general manager of the Silica Brick Co. at Joliet, Ill., going to Japan in 1909 as its representative. He represented the Okha Cement Co. in India for several years.

Quarries

Kingston Trap Rock Co. has moved its executive offices from Plainfield, N. J., to Kingston, N. J.

W. C. Busick, Osceola, Iowa, has purchased and installed a new rock crusher having a capacity of 150 tons of agricultural limestone a day.

Lovilia, Iowa: The WPA rock quarry on the L. Ellis farm has been closed. The crusher has been moved to a quarry south of Melrose.

Oskaloosa, Iowa: The Mahaska farm bureau board is seeking a site for quarrying limestone. The stone will be crushed for use in soil conservation.

Fort Madison, Iowa: Operation of two stone quarries has been discontinued in Lee county because the WPA would no longer pay the rental on machinery.

Creston, Iowa: The WPA rock quarrying project in Union county, southwest of Thayer, handicapped by the severe weather during the winter, is now in full swing. A vein of good road-building limestone of undetermined depth has been uncovered.

Washington, Iowa: Crushing was resumed May 1 at the Grace Hill quarry to prepare material for county roads that were not completely surfaced last year. Ed Wahl, who was awarded a crushing and hauling contract last year, is now starting on the final stages of the work.

Denver, Colo.: The city has established a permanent quarry near Golden, Colo., to produce crushed rock for use in building and repairing streets and highways. The quarry is on state land owned by the National Guard and has been operated by WPA. The city bought a crusher for $2000.

Frank Klick of Pittsburgh, Penn., has begun removal of 30,000 tons of sandstone near Morgantown, W. Va., on the D. H. Gowring property east of Dellslow for sale to the federal government. The stone will be shipped to Morgantown, and through the McClain Sand Co. docks in Westover, by barge, to the Monongahela river for use in riprap construction.

Sand and Gravel

Forest Junction, Wis.: Operation of a gravel crushing plant by the town of Brillion at a leased site on lands of Mrs. George Schnell was recently begun.

Hallett Construction Co. has set up gravel loading equipment on the Peterson farm 2 miles west of Granite Falls, Minn., preliminary to paving Road 212. The company is completing a paving job at Renville, hauling gravel from a pit at Montevideo.

Maryville, Mo.: The first Nodaway county WPA project has been finished — construction of five miles of highway running south to the township line from Highway 4. A county gravel pit has been opened near Pickering and Clearmont to produce material for several small bridges and culverts.

Gypsum

Best Brothers Keene's Cement Co., Chicago, Ill., has appointed The Buchen Co., Chicago, to handle its advertising. It plans a campaign in business papers.

Manufacturers

Hendrick Manufacturing Co. announces that it will hereafter handle its "Mitco" line through its New York City office at 30 Church St., of which B. G. Dann is manager.

Pangborn Corp., Hagerstown, Md., had an exhibit of cleaning tables, barrel, cylinder block machines and dust collector at the Fortieth Foundry and Allied Industry Exposition in Detroit, Mich., May 5 to 9.

Marion Steam Shovel Co., Marion, Ohio, is opening an office in San Antonio. Paul E. Piersol is in charge, his temporary headquarters being with the Marion distributor, Motor Equipment Corp., 419 N. Flores St.

Chain Belt Co., Milwaukee, Wis., announces that its Pittsburgh, Penn., office has been moved to Room 526, Grant Bldg. G. E. Mahoney, formerly sales engineer in the Milwaukee office, has been transferred to Pittsburgh.

Wickwire Spencer Steel Co., New York, N. Y., has promoted H. A. Larsen, formerly manager of the structural products division on the West Coast, to Pacific Coast sales manager for all products. His headquarters is 101 Townsend St., San Francisco, Calif.

Waukesha Motor Co., Waukesha, Wis., at a recent meeting of its board, elected James E. DeLong, formerly vice-president, to the presidency, which has been vacant since the death of H. L. Horning on January 4. James B. Fisher, chief engineer, was elected vice-president.

Chicago Pneumatic Tool Co., New York, N. Y., has opened a new sales and service branch at 2415 Commerce St., Dallas, Texas, which is in charge of D. G. Reeder, district manager. The company's Pittsburgh office has been moved to 810 Chamber of Commerce Bldg., Pittsburgh, Penn.

Link-Belt Co., Chicago, Ill., announces appointment of the following distributors: Pe-

trie Tractor and Equipment Co., of Billings, Butte and Great Falls, Mont.; Industrial Supplies, Inc., Poplar and River Front, Memphis, Tenn.; and Tulio Ospina y Cia., Medellin, Colombia.

American Engineering Co., Philadelphia, Penn., announces appointment of John F. Cooke to have charge of sales in the hoist, pump and marine division. The company has moved its New York sales office to larger quarters in the Evening Post Bldg., 75 West St., New York, N. Y.

American Foundry Equipment Co., Mishawaka, Ind., has appointed the following territorial sales engineers: Geo. H. Walsh, Graystone Hotel, Buffalo, N. Y.; Harry G. Mouat, Martin Bldg., Birmingham, Ala.; Frank Roder Smith, P. O. Box 497, New Orleans, La.; T. C. Ruhling & Co., Burt Bldg., Dallas, Texas; and M. B. Heisner, 303 Sugar Bldg., Denver, Colo.

The Claude B. Schneible Co., Chicago, Ill., has added the following sales representatives: Parry Engineering Co., 154 Nassau St., New York, N. Y.; Ferdinand G. Schultz, 215 Questend Ave., Pittsburgh, Penn.; Grant & Co., 2144 E. 7th St., Los Angeles, Calif.; Carl F. Miller & Co., 228 W. Pacific Ave., Spokane, Wash.; Pacific Graphite Works, 40th and Linden Sts., Oakland, Calif. The company has issued Catalog 10 dealing with the wet method of dust and fume collection.

Lincoln Electric Co. announces the following personnel changes: J. S. McKeighan has been transferred to the sales staff at 1712 Catalpa Drive, Dayton, Ohio, operating under the Cincinnati office. J. B. McCormick has been transferred from Philadelphia to the Los Angeles district, being stationed at 3160 Montecito Ave., Fresno, Calif. Paul W. James has been transferred to 16½ Crandall St., Binghamton, N. Y., operating under the Syracuse office. The Major Engineering Works has moved its offices from 210 Jackson Ave. to 312 Second St., Des Moines, Ia.

Caterpillar Tractor Co., Peoria, Ill., announces that its board has re-elected officers of the company with the following changes: A. T. Brown, formerly general auditor and assistant secretary, was elected a vice-president; D. G. Sherwin, vice-president, was also named treasurer, succeeding Henry M. Hale, who has been appointed manager of the eastern sales division; E. R. Galvin, former eastern sales manager, was advanced to assistant general sales manager. Since the appointment of Manuel Rogers as general factory manager and James R. Munio as factory manager of the tractor plant, Benjamin B. Gracier has been promoted to factory manager of the road machinery plant. W. E. Bergstrom has been advanced to assistant general auditor.

Trade Literature

The following literature is obtainable on request to the respective sponsor:

Compressors. Catalog 7502-E, 28 pages, covers "Type 30" industrial compressors and vacuum pumps. INGERSOLL-RAND CO., New York, N. Y.

"Temperature Conversion Chart." A graph shows pyrometric cones, degrees Centigrade from 800 to 2100, and degrees Fahrenheit. E. J. LAVINO & CO., Philadelphia, Penn.

Mixers. A 4-page bulletin describes the "14-S Dandie Trail-Mix," which weighs only 5100 lb. and is only 90 in. wide. KOEHRING CO., Milwaukee, Wis.

Wash Boxes. Dimensions, diagrams, and uses of a mechanical conveyor type wash box are given in Bulletin 51. GOOD ROADS MACHINERY CORP., Kennett Square, Penn.

Welding. Latest information on "Welding and Cutting High Chromium Steels" is given in an 8-page illustrated booklet. LINDE AIR PRODUCTS CO., New York, N. Y.

Welders. Bulletin 910, 16 pages, covers the Noel "Speed Arc" welders. Dimension tables are included. THE IDEAL ELECTRIC & MANUFACTURING CO., Mansfield, Ohio.

Agitators. "Minogue" agitators for cement mills, of high uniformity in results and low power requirements are described in a 4-page leaflet. MANITOWOC ENGINEERING WORKS. Manitowoc, Wis.

Mixers. Type "E" mixers, with new reinforced bottom construction, are featured in 8-page booklet. THE PATTERSON FOUNDRY & MACHINE CO., East Liverpool, Ohio.

Mining Machinery. Bulletin 301 is a 36-page book dealing with rib-cone ball mills, screen wheel classifiers, central discharge mills and auxiliary equipment. STRAUB MFG. CO., Oakland, Calif.

Scrapers. Carryall scrapers made in 12, 8, and 6-yd. sizes for tractors of 95 to 40 hp. are detailed, with specifications, in Form SC-101, 16 pages. R. G. LE TOURNEAU, INC., Peoria, Ill.

Drifters. A new line of drifters and a detachable bit are the subjects of new bulletins. Bulletin 88-W describes compressed air aftercoolers. SULLIVAN MACHINERY CO., Claremont, N. H.

Motors. Bulletins 215 and 216, 4 pages each, deal with heavy-duty motors for direct current 40-deg. C rating. RELIANCE ELECTRIC AND ENGINEERING CO., Cleveland, Ohio.

Controllers. Bulletin 440 covers a new series of Ampliset free-vane controllers for time-temperature, flow, liquid level, pressure, time-pressure and humidity. THE BRISTOL CO., Waterbury, Conn.

Scales. "Weighed in Motion" is a 4-page bulletin featuring two developments for weighing mine cars in motion—an automatic tripping device and type "S" lever design. FAIRBANKS, MORSE & CO., Chicago, Ill.

Hollow Drill Steel. Booklet 83 describes the manufacture and testing of hollow drill steel and includes a page of "Useful Data" of general interest to quarrying-tool users. BETHLEHEM STEEL CO., Bethlehem, Penn.

Review. An 8-page booklet outlines briefly typical applications of Raymond equipment in pulverizing installations, describing how various production problems were met. RAYMOND BROS. IMPACT PULVERIZER CO., Chicago, Ill.

Electric Equipment for Power Shovels. The history of the development of the power shovel with a listing of the electrical apparatus used with each type is well presented in a 24-page booklet. GENERAL ELECTRIC CO., Schenectady, N. Y.

Dump Units and Scrapers. Bulletins H B 136, SL-1135, and HS 100 deal with hydraulic dump units for 1½- to 2-ton trucks and other sizes and with "Dig-N-Carry" scrapers for moving earth economically. THE HEIL CO., Milwaukee, Wis.

Roll Crushers. An 8-page booklet, Form 514, outlines the purpose, limitations, advantages, construction, capacity and operation of roll crushers. PIONEER GRAVEL EQUIPMENT MANUFACTURING CO., Minneapolis, Minn.

Shovels. A broadside reproduces telegrams from users of 10-B shovels telling of their experience with the machines. Installation photographs from various states are reproduced. BUCYRUS-ERIE CO., South Milwaukee, Wis.

Testing Screens. For compactness, portability and suitability to laboratory use, various screens are described in an illustrated folder. Hendrick products of all kinds are described in another smaller folder. HENDRICK MANUFACTURING CO., Carbondale, Penn.

Roller Bearings. A new manual of engineering data for application of tapered roller bearings to mine and quarry cars has been released. The Tyson lip seal, labyrinth seal and combined nut-and-lip seal are illustrated. TYSON ROLLER BEARING CO., Massillon, Ohio.

"Typical Specifications for Low-Cost Wearing Courses for Roads Stabilized with Calcium Chloride and Binder Soil," Bulletin 20, is a revised booklet showing trend toward reduction of proportion of soil fines, with new gradation allowances. CALCIUM CHLORIDE ASSOCIATION, Detroit, Mich.

Paving Equipment. Catalog PM 36, 60 pages, is a pictorial review of modern road building, showing 100 action pictures of construction. The manufacturer also has issued Catalogs M 36 on mixers and Catalog P 36 on pumps, each 40 pages, and each featuring latest designs. THE JAEGER MACHINE CO., Columbus, Ohio.

Shovels. An illustrated 24-page booklet of 8½x11-in. size, features the ¾ swing Badger shovel designed for speed. The book discusses methods of operating on all types of jobs. Another bulletin entitled "Judge Motor Graders at the Blade," featuring the "77" senior dual drive motor grader, is also available. AUSTIN-WESTERN ROAD MACHINERY CO., Aurora, Ill.

Engineering Journal. The third edition of the Timken Engineering Journal, 260 pages, is now available. Bound in a three-ring binder with stiff covers, with marginal tab indexes, it contains descriptions and illustrations of Timken bearings; dimension sheet tabulations; data on shims, locknut and washer assemblies, annular groove closures, tubes, etc., and discussions of cup and cone fitting practice. TIMKEN ROLLER BEARING CO., Canton, Ohio.

Power Transmission Equipment. A new 208-page catalog, No. 1500, devoted exclusively to power transmission equipment, features anti-friction roller bearing units, streamlined babbitted bearings, new types of take-ups and other improvements. Three other booklets cover automatic firing with coal for boilers up to 300 hp.: No. 1541 deals with automatic coal burners for the home; No. 1537 with stoker firing in commercial heating plants, and No. 1538 with automatic generation of process steam. LINK-BELT CO., Chicago, Ill.

Pumps. The following Worthington leaflets have been released: W-323-B3A, Self-Priming Pumping Units; W-320-B2, Centrifugal Fire Pumps; W-317-B5, Freflo Centrifugal Pumps for Underpass Drainage, Type FJ; W-210-B20, A Simple Test for Your Steam Power Plant; Feedwater Heating; W-321-B6A, Condensate Return Units; S-500-B29, Diesel Engines, Vertical 4-Cycle Direct-Injection Type C; W-318-B7, Balanced Multi-Stage Volute Centrifugal Pumps, Type UX; W-111-B8 and B9, Horizontal Single Piston Pumps, Types AC and AA; W-423-B3, Vertical Triplex Single-Acting Power Pumps. WORTHINGTON PUMP AND MACHINERY CORP., Harrison, N. J.

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Wickwire Spencer has facilities for perforating all thicknesses. Their Engineers, therefore, are impartial, and base recommendations only upon the desire to give the greatest dollar value. Put your problem before them. Write today for information or request a representative to call. Send for complete information.
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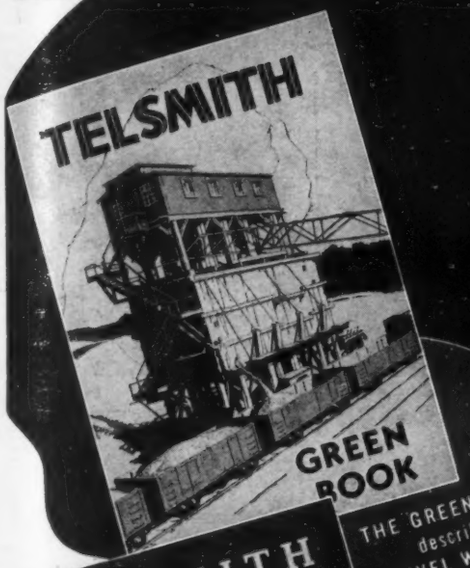
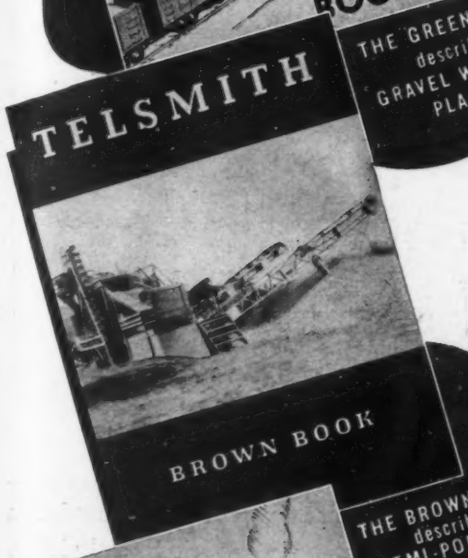
THESE 3 BOOKS TELL YOU all you want to know about *Plant Layout*



THE GREEN BOOK describes GRAVEL WASHING PLANTS



THE BROWN BOOK describes SEMI-PORTABLE QUARRY and GRAVEL PLANTS

THE BLUE BOOK describes QUARRY PLANTS

K-1-36

What's new in plant layout? What has been the influence of today's conditions, competition, and markets? What changes have new and improved equipment brought about in layout and production . . . in gravel washing plants . . . in quarry plants? Where do semi-portable plants fit into the present picture?

You will want to know the answers to these questions . . . and to other questions pertaining particularly to your own plant . . . whether you are modernizing or planning a new plant.

That's the purpose of these three books. They contain diagrams of actual plant layouts . . . of every size and type . . . with descriptions and specifications of their equipment and how it has been balanced and coordinated to give the wanted results.

Diagrams! Facts! Figures! Complete information in concentrated form — with the old "selling talk" hooey left out.

Any one or all these books . . . GB-11 (Gravel Washing Plants); SP-11 (Semi-Portable Plants); QP-11 (Quarry Plants)... are yours on request *without cost or obligation.*

SMITH ENGINEERING WORKS

508 E. CAPITOL DRIVE **MILWAUKEE, WISCONSIN**

Associates in Canada: Canadian Ingersoll-Rand Co., Ltd.
Montreal, Toronto, Winnipeg, Vancouver.

50 Church St. New York City
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Choctaw C. & M. Co. Memphis, Tenn.
Wilson-Weesner-Wilkinson Co. Knoxville and Nashville, Tenn.

TELSMITH

McGrath Sand and Gravel Company Likes G-E TELLURIUM CABLE

J. A. Crary, G-E salesman, exhibits the 500-ft 3-conductor 2300-volt tellurium-rubber cable, which runs between shore and dredge of the McGrath Sand and Gravel Company, Pekin, Ill.

THIS CABLE WILL GIVE LONG-TIME SERVICE

THAT we know for sure. In the years that G-E tellurium-rubber cable has been on the market it has been thoroughly tried out on all sorts of electric portable equipment. The many repeat orders prove that it always gives good service.

For example, President J. W. McGrath writes:

> " . . . *we are well pleased with the portable cable that we are using at our different plants to transport power from the transformers to our dredges.*"

The Reason: The 60-per-cent all-rubber jacket on G-E portable cable is tellurium-compounded, which makes it tough—tough as the tread of an automobile tire. It is identically the same jacket as is used on G-E mining cable, which has passed the drastic tests of the U. S. Bureau of Mines.

You can count on this cable to keep down maintenance costs—by reducing replacements, preventing shutdowns of power supply, shortening tie-up periods, and giving, added protection to life and equipment.

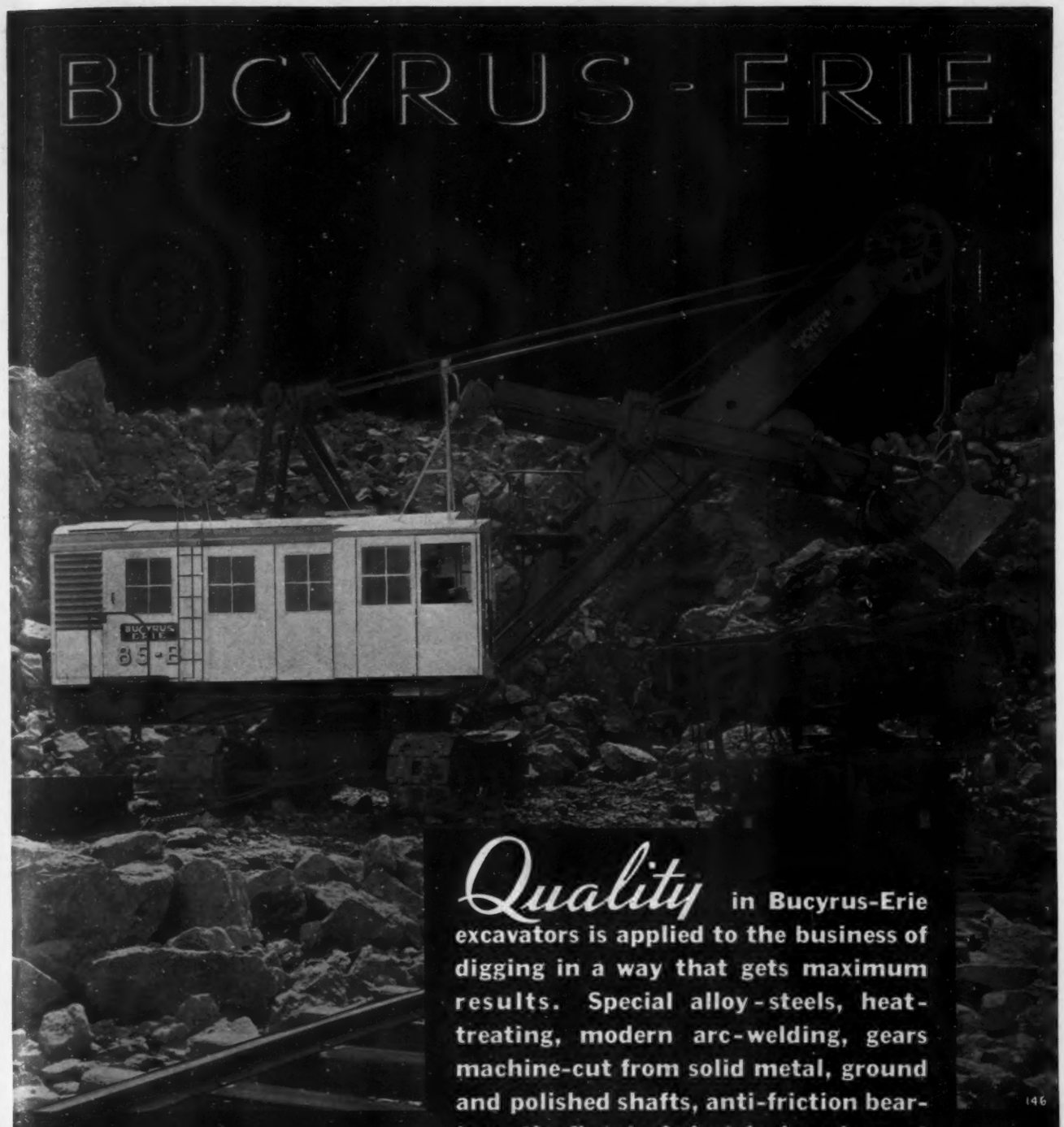
All Types and Sizes: You can get tellurium-rubber cable, from small portable cords up to large three -and four-conductor types for high-voltage service.

When next you require portable cable for replacement on any equipment, *specify tellurium.* We know you will be well satisfied. For prices and complete information see Bulletins GEA-1728 and GEA-1918. Address the nearest G-E distributor, G-E sales office, or General Electric Company, Dept. 6A—201, Schenectady, N. Y.

520-70

GENERAL ELECTRIC

BUCYRUS-ERIE



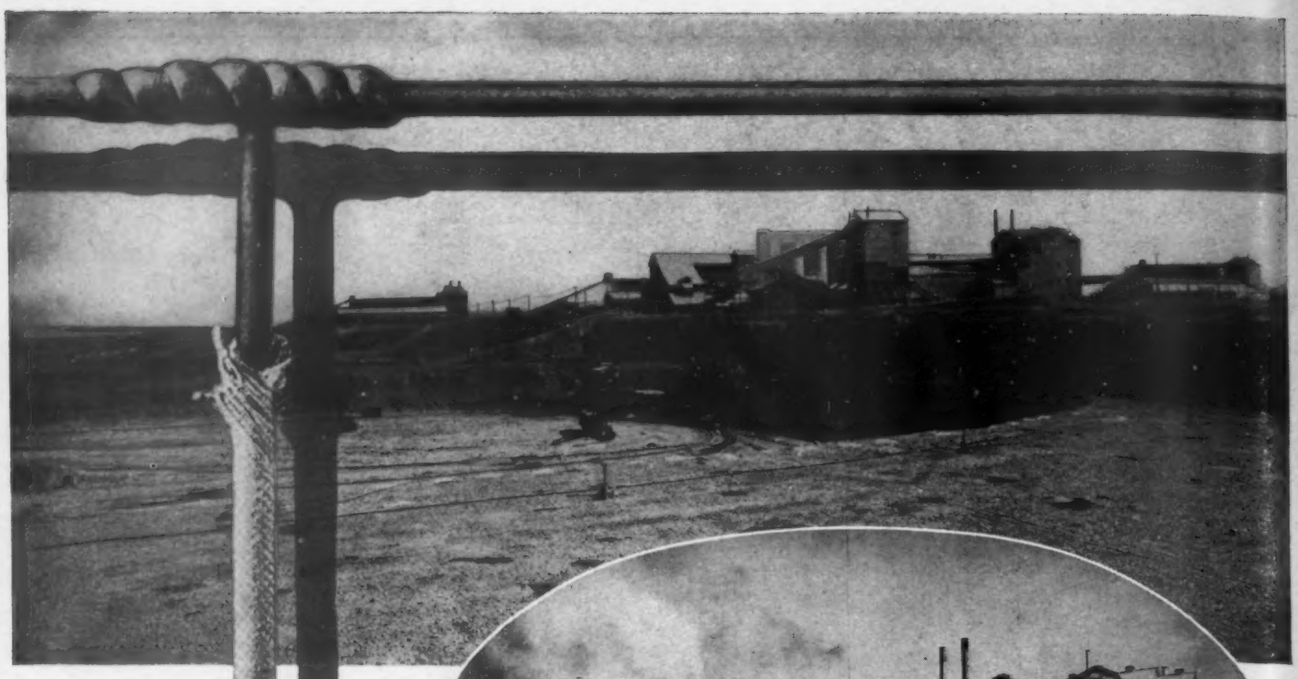
● Illustrated: 85-B loading rock from cement quarry in New York State.

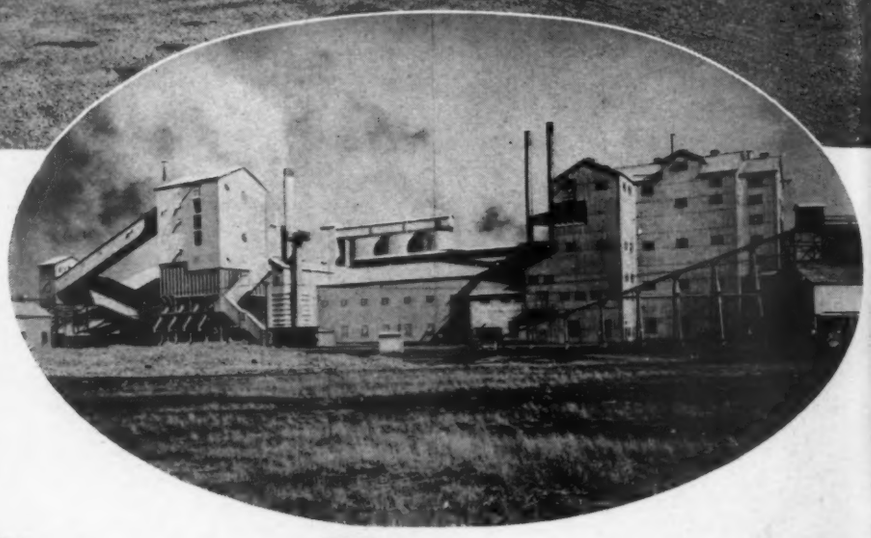
Quality in Bucyrus-Erie excavators is applied to the business of digging in a way that gets maximum results. Special alloy-steels, heat-treating, modern arc-welding, gears machine-cut from solid metal, ground and polished shafts, anti-friction bearings, the finest of electrical equipment and control, all contribute to the famous Bucyrus-Erie dependability that means steady production, the modern Bucyrus-Erie speed that means profits for owners. Write for information on the size that fits your requirements!

146

BUCYRUS ERIE

EXCAVATING, DRILLING, AND MATERIAL HANDLING EQUIPMENT...SOUTH MILWAUKEE, WISCONSIN, U. S. A.





At the Kelley Island Lime and Transport Company.

CORDEAU-BICKFORD *at the* Kelley Island Lime and Transport Co.

They want "little pieces" at the White Rock Plant at Clay Center, Ohio. Little pieces mean easier removal; save time, save shovels, save powder.

Better Fragmentation is but one of the five reasons why Cordeau-Bickford Detonating Fuse is used here—as elsewhere in the quarrying industry.

Here are the five reasons:

1. More Work from Explosives: each cartridge is detonated directly and has the added force of a primer cartridge.
2. Simplified Loading: there are no caps in the holes.
3. Less Hazard: Cordeau-Bickford is insensitive to ordinary shocks. It must be detonated.
4. Fewer But Bigger Shots: equipment moved less often, for Cordeau-Bickford not only detonates each hole but connects all holes.
5. Better Fragmentation: planned rotation firing, possible with Cordeau, permits split second relief of burden, letting each charge work to best advantage.

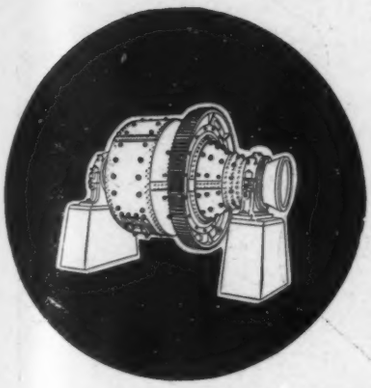
Cordeau-Bickford Detonating Fuse is manufactured with the same care that has made Ensign-Bickford Safety Fuse famous since 1836. Let us send you a copy of our Centennial Booklet—and tell you more about Cordeau.

1836 BEGINNING A NEW CENTURY 1936 · ENSIGN-BICKFORD SAFETY FUSE ·

CB-52

The ENSIGN-BICKFORD COMPANY, Simsbury, Connecticut

SAFETY FUSE Since 1836 • CORDEAU-BICKFORD DETONATING FUSE



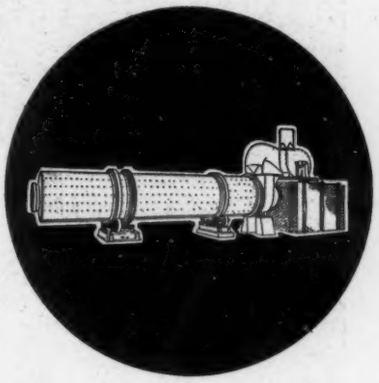
Pulverizer Maintenance Costs---only 2 cents per ton!

The Hardinge Mill holds the record for low maintenance costs for grinding ceramic materials, limestone, clay, cement, clinker, coal and ores. This also means lowest overall grinding costs.

When grinding dry—the reverse current air classifier keeps a dense "fog" of material between balls or pebbles at all times, preventing metal to metal (or pebble to pebble) contact.

When grinding wet—the cones keep the mass in circulation without rubbing against the heads which reduces both ball and liner wear and increases grinding efficiency.

Write for Bulletin 13C.



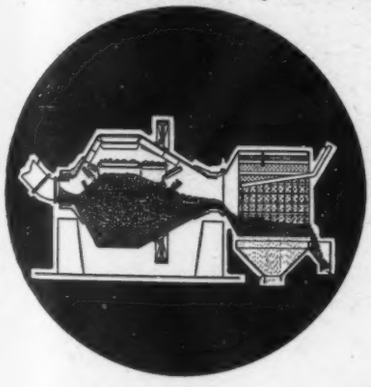
If Drying Efficiency is 40% It Can Be Raised to 70%

Unless you have made a "heat balance" recently or installed a modern Ruggles-Coles Dryer, the chances are, your drying efficiency is off.

A difference of 10% in drying efficiency (to say nothing of 30%) may pay for the cost of revamping or replacing your dryer in one year's time.

Rotary dryer performance has changed considerably in the last few years.

Control systems—mechanical improvements—more efficient heat transfer methods, all contribute to build up overall efficiency without increase in capital cost. Ruggles-Coles Dryers incorporate all these improvements. What do you dry?



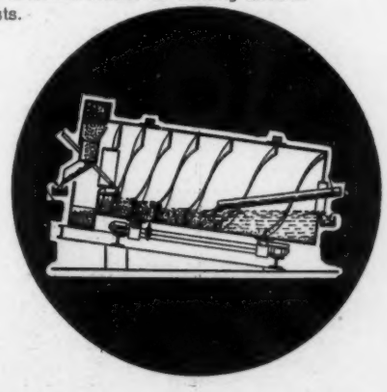
A Scrubber That Reduces Clay Balls to Slime---in *one pass*

Mass Weight of Material, causes mass pressure to disintegrate thoroughly without crushing or grinding.

High Speed, keeps the mass extremely live—greatly reduces the water required.

Conical Ends, assure a quick and positive feed and discharge—with a vertical and lateral circulation of the mass, to speed up passage through drums.

No Internal Moving Parts, no grates, elevating buckets, internal shafts or cutting blades —means negligible maintenance and low power costs.

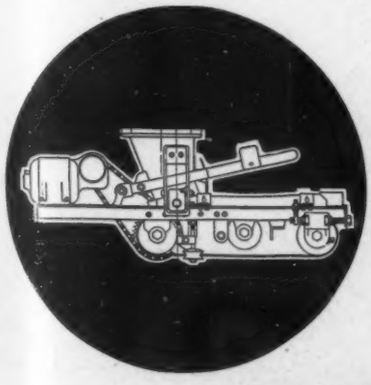


Classifier and Washer Capacity Doubled Per Square Foot of Floor Space

For that indoor job of classifying or washing—silt from sand—impurities from salts or fines from coarse particles, the Hardinge Counter Current Classifier is the ideal unit to use. It is easily acid-proofed—can be made practically gas tight. There are no dead corners to become stagnant or mechanical parts in the classifying zone to clog or jam.

Separations as coarse as 10 mesh or as fine as 325 mesh have been easily secured in a unit that requires half the floor space of other standard mechanical Classifiers.

Write for Bulletin 39.



A Feeder That Does the "Impossible"

No one would believe that a Hardinge Constant Weight Feeder installed in front of almost any Pulverizer will increase the capacity of that pulverizer 10 to 25%—unless he installed the feeder or checked the results himself. Users have done just that and reported the capacity increase cited. That is not all! A record of the weight fed is kept as well. The unit is sturdy and inexpensive.

When an item costing 5% of the unit it serves can increase capacity 15%—it is worthy of your investigation now!

HARDINGE COMPANY

INCORPORATED

New York, N. Y.
122 E. 42nd Street

York, Pa.
Main Office and Works

Chicago, Ill.
205 W. Wacker Drive

Your Most Important Question When Buying Removable Bits

When you buy removable bits on price you take a long chance on quality. Why take this chance when for a few cents more per bit you can have the assurance of the high quality and outstanding performance that go with Timken Bits?

If we used a cheaper material than the special Timken Electric Furnace Steel of which Timken Bits are made, and took less care in vital manufacturing processes — including the exclusive Timken deep hardening process — we could produce a lower price bit. But quality is too deeply-rooted in Timken traditions to be thus lightly sacrificed.

The leadership of Timken Bearings during the last 38 years, and their world-wide dominance today were achieved by strict adherence to this policy of quality first.

Complete Stocks Maintained in Principal Distributing Centers

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

TIMKEN BITS

THE RIGHT GRINDING MACHINE FOR EVERY NEED

In the list below of grinding and pulverizing machinery that we manufacture there is a machine which will meet the requirements for the reduction of your materials.

KOMINUTER	for straight granulating.
TUBEMILL	for straight pulverizing.
UNIDAN	multi-compartment mill, combining granulating and pulverizing.
UNIKOM	multi-compartment mill with overhung preliminary grinding chamber, combining granulating and pulverizing.
TIRAX	multi-compartment air swept mill for drying, granulating and pulverizing coal, etc.
ATOX	air swept high speed, vertical shaft, pulverizer.

If your problem is wet grinding or dry grinding—open or closed circuit—gravity discharge or air swept—combined drying and grinding—direct firing or bin system—one of the machines above will meet the requirements either alone or in conjunction with our separators or classifiers, so that practically every condition can be met.

In addition to the above machinery we manufacture also a complete line of accessories for the grinding operation such as air separators and classifiers, Trix wet separator, fans, liners, grinding bodies, spray casings, symetro gear boxes, feeders, conveyors, pumps, dust casings, washmills, etc.

An experience of over 50 years in the grinding of miscellaneous materials is available for the solution of your grinding problem.

F. L. SMIDTH & CO.

Designers of Cement Making Factories
Manufacturers of Cement Making Machinery

225 BROADWAY **NEW YORK, N. Y.**

Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 2

Abrasive Wheels
Manhattan Rubber Mfg. Div. of Raybestos - Manhattan, Inc.

Acetylene Welding Rod
American Steel & Wire Co. (United States Steel Corp. Subsidiary).

Aggregate Admixture
Calcium Chloride Ass'n

Agitators, Thickeners and Slurry Mixers
Dorr Co.
Hardinge Co., Inc.
F. L. Smidth & Co.

Airveyor
Fuller Co.

Air Compressors
Chicago Pneumatic Tool Co.
Fuller Co.
Nordberg Mfg. Co.
F. L. Smidth & Co.
Traylor Eng. & Mfg. Co.

Air Filters
Fuller Co.

Air Separators
Bradley Pulverizer Co.
Hardinge Co., Inc.
Raymond Bros. Impact Pulv. Co.
Sturtevant Mill Co.

Automatic Weighers
Richardson Scale Co.

Babbitt Metal
Joseph T. Ryerson & Son, Inc.

Backdiggers
Lima Locomotive Works, Inc. (Ohio Power Shovel Co.)

Backfillers
Austin-Western Road Machy. Co.
Bucyrus-Erie Co.
Harnischfeger Corp.
Lima Locomotive Works, Inc. (Ohio Power Shovel Co.)

Bagging Machinery
Richardson Scale Co.

Balls, Grinding, (See Grinding Balls)

Balls (Tube Mill, etc.)
Allis-Chalmers Mfg. Co.
Carnegie-Illinois Steel Corp. (United States Steel Corp. Subsidiary)
Hardinge Co., Inc.
F. L. Smidth & Co.

Bar Benders and Cutters
Koehring Co.

Batchers
Fuller Company

Bearings
Chain Belt Co.
Link-Belt Co.
Joseph T. Ryerson & Son, Inc.
Timken Roller Bearing Co.

Bearings (Anti-Friction)
Timken Roller Bearing Co.

Bearings (Roller)
Timken Roller Bearing Co.

Bearings (Tapered Roller)
Timken Roller Bearing Co.

Bearings (Thrust)
Timken Roller Bearing Co.

Belt Fasteners
Flexible Steel Lacing Co.

Belt Lacing (Steel)
Flexible Steel Lacing Co.

Belting (Elevator and Conveyor)
Goodyear Tire & Rubber Co., Inc.
Manhattan Rubber Mfg. Div. of Raybestos - Manhattan, Inc.

Belting (Metal, Conveyor, High and Low Temperature)
Wickwire Spencer Steel Co.

Belting (V Type)
Goodyear Tire & Rubber Co., Inc.
Manhattan Rubber Mfg. Div. of Raybestos - Manhattan, Inc.

Belting (Transmission)
Goodyear Tire & Rubber Co., Inc.
Manhattan Rubber Mfg. Div. of Raybestos - Manhattan, Inc.

Bin Gates
Chain Belt Co.
Fuller Co.
Good Roads Machy. Corp.
Link-Belt Co.
Sprout, Waldron & Co., Inc.
Traylor Eng. & Mfg. Co.

Bins
Austin-Western Road Machy. Co. (Sand and Gravel)
Good Roads Machy. Corp.
Pioneer Gravel Equipt. Mfg. Co. (Steel)
Traylor Eng. & Mfg. Co.

Blasting Machines
Atlas Powder Co.
E. I. du Pont de Nemours & Co., Inc.

Blasting Supplies
Atlas Powder Co.
E. I. du Pont de Nemours & Co., Inc.

Blasting Powder (See Powder, Blasting)

Blocks (Pillow, Roller Bearing)
Link-Belt Co.
Timken Roller Bearing Co.

Blocks (Sheave)
American Manganese Steel Co.

Bodies (Car & Motor Truck)
Easton Car & Construction Co.
Hug Co.

Boilers
Babcock & Wilcox Co.

Brake Lining (Asbestos)
Manhattan Rubber Mfg. Div. of Raybestos - Manhattan, Inc.

Breakers (Primary)
Smith Engineering Works
Williams Patent Crusher & Pulv. Co.

Brick Machinery (Concrete)
W. E. Dunn Mfg. Co.

Buckets (Clamshell, Grab, Orange Peel, etc.)
Harnischfeger Corp.
Hayward Company
Link-Belt Co.
Owen Bucket Co.

Buckets (Dragline and Slackline)
American Manganese Steel Co.
Bucyrus-Erie Co.
Owen Bucket Co.
Page Engineering Co.
Pioneer Gravel Equipt. Mfg. Co.

Buckets (Dredging and Excavating)
Harnischfeger Corp.
Owen Bucket Co.

Buckets (Elevator and Conveyor)
Chain Belt Co.
Cross Engineering Co.
Hendrick Mfg. Co.
Jeffrey Mfg. Co.
Link-Belt Co.
Pioneer Gravel Equipt. Mfg. Co.
Taylor-Wharton Iron & Steel Co.

Buggies (Dump)
R. G. Le Tourneau, Inc.

Bulldozers
Koehring Co.
R. G. Le Tourneau, Inc.

Bushings (Machined or Processed)
Manganese Steel Forge Co., Inc.

Cableways
American Steel & Wire Co. (United States Steel Corp. Subsidiary)
Broderick & Bascom Rope Co.
General Electric Co.
Link-Belt Co.
John A. Roebling's Sons Co.
Williamsport Wire Rope Co.

Calcinators
Bradley Pulverizer Co.

Calcining Kettles (Gypsum)
J. B. Ehrsam & Sons Mfg. Co.

Cap Crimpers and Fuse Cutters
Ensign-Bickford Co.

Calcium Chloride
Calcium Chloride Ass'n.

Caps (Blasting)
Atlas Powder Co.
E. I. du Pont de Nemours & Co., Inc.

Car Pullers
Link-Belt Co.

Carryalls
R. G. Le Tourneau, Inc.

Cars (Dump)
Carnegie-Illinois Steel Corp. (United States Steel Corp. Subsidiary)

Cars (Quarry & Gravel Pit)
Austin-Western Road Machy. Co.
Carnegie-Illinois Steel Corp. (United States Steel Corp. Subsidiary)
Easton Car & Construction Co.

Castings
Babcock & Wilcox Co.
Eagle Iron Works (Grey Iron)
Link-Belt Co.
Timken Roller Bearing Co.

Cement Making Machinery
F. L. Smidth & Co.

Cement Process
Cement Process Corp.

Cement Pumps
Fuller Co.
F. L. Smidth & Co.

Central Mixing Plants
Chain Belt Co. (Concrete)

Chain (Dredge and Steam Shovel)
Bucyrus-Erie Co.
Jeffrey Mfg. Co.

Chain (Elevating and Conveying)
American Manganese Steel Co.
Chain Belt Co.
Link-Belt Co.

Chain Drives
Chain Belt Co.

Chain Systems (Kilns)
F. L. Smidth & Co.

Chemicals
Calcium Chloride Ass'n.

Chute or Launder Lining
Goodyear Tire & Rubber Co., Inc.
Manhattan Rubber Mfg. Div. of Raybestos - Manhattan, Inc.

Chutes and Chute Liners
American Manganese Steel Co.

Clarifiers
Hardinge Co., Inc.

Classifiers
Allen Cone & Machy. Corp.
Hardinge Co., Inc.
Link-Belt Co.

Clay Working Machinery
Bonnot Company

Clips (Wire Rope)
American Steel & Wire Co. (United States Steel Corp. Subsidiary)
Broderick & Bascom Rope Co.
Williamsport Wire Rope Co.

Coal Crushers and Rolls
Austin-Western Road Machy. Co.
Williams Patent Crusher & Pulv. Co.

Coal Pulverizing Equipment
Babcock & Wilcox Co.
Bonnot Company
Bradley Pulverizer Co.
Gruendler Crusher & Pulv. Co.
Pennsylvania Crusher Co.
Raymond Bros. Impact Pulv. Co.
F. L. Smidth & Co.
Williams Patent Crusher & Pulv. Co.

Compressed Air Rock Drills
Chicago Pneumatic Tool Co.
Cleveland Rock Drill Co.

Compressors (See Air Compressors)

Concrete Products Machinery
W. E. Dunn Mfg. Co.

Concrete Slab Raising Equipment (Mud-Jack)
Koehring Co.

Conveyor Belting (See Belting)

Conveyor Idlers and Rolls
Chain Belt Co.
Link-Belt Co.

Conveyors and Elevators
Earle C. Bacon, Inc.
Chain Belt Co.
Fuller Company
Good Roads Machy. Corp.
Jeffrey Mfg. Co. (Vibrating)
Lewistown Fdy. & Mach. Co.
Link-Belt Co.
Pioneer Gravel Equipt. Mfg. Co.
Robins Conveying Belt Co.
F. L. Smidth & Co.
Smith Engineering Works
Sturtevant Mill Co.
Traylor Eng. & Mfg. Co.

Conveyors (Pneumatic)
Fuller Company

Conveyors (Screw)
Link-Belt Co.

Conveyoweighs
Richardson Scale Co.

Coolers (See Kilns and Coolers, Rotary)

Correcting Basins
F. L. Smidth & Co.

Couplings (Air Hose)
Cleveland Rock Drill Co.

Couplings (Flexible and Shaft)
Chain Belt Co.
Link-Belt Co.

Cranes (Clamshell)
Austin-Western Road Machy. Co.
Bucyrus-Erie Co.
Harnischfeger Corp.
Koehring Co.

Cranes (Crawler and Locomotive)
Austin-Western Road Machy. Co.
Bucyrus-Erie Co.
Harnischfeger Corp.
Koehring Co.
R. G. Le Tourneau, Inc.
Lima Locomotive Works, Inc (Ohio Power Shovel Co.)
Link-Belt Co.
Northwest Engineering Co.
Thew Shovel Co. (Electric, gasoline and steam)

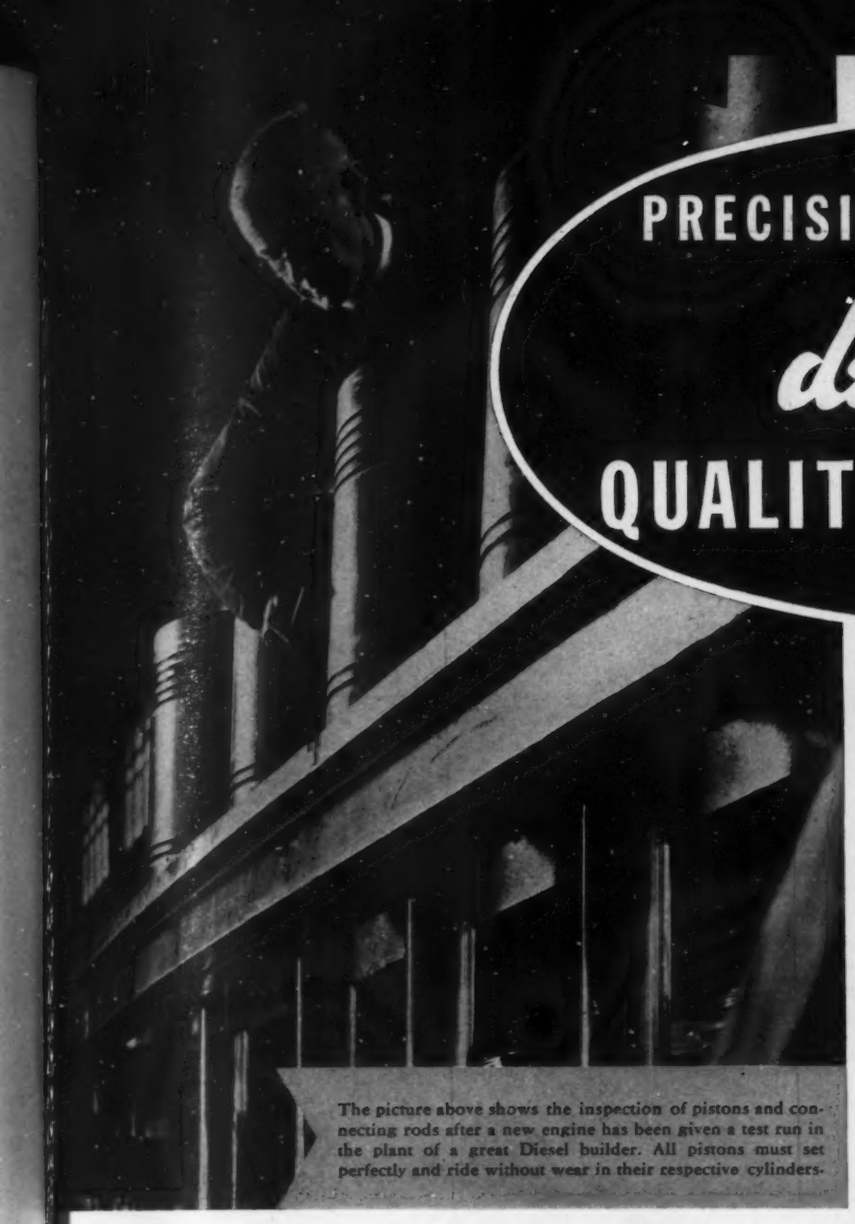
Cranes (Excavator)
Koehring Co

Cranes (Overhead Traveling Electric)
Harnischfeger Corp.

Crusher Parts
American Manganese Steel Co.
Pennsylvania Crusher Co.
Taylor-Wharton Iron & Steel Co. (Manganese)

Crushers (Hammer)
Austin-Western Road Machy. Co.
Carnegie-Illinois Steel Corp. (United States Steel Corp. Subsidiary)
Dixie Machy. Mfg. Co.
Gruendler Crusher & Pulv. Co.
Jeffrey Mfg. Co.
Pennsylvania Crusher Co.
Sturtevant Mill Co.
Williams Patent Crusher & Pulv. Co.

PRECISION BUILT DIESELS *demand* QUALITY LUBRICANTS



The picture above shows the inspection of pistons and connecting rods after a new engine has been given a test run in the plant of a great Diesel builder. All pistons must set perfectly and ride without wear in their respective cylinders.

The efficiency of a Diesel engine depends upon the accuracy of the machining of the cylinder block. Above, a workman is checking this operation. The use of Gulf lubricants for all plant machinery assures precision in each operation.

Gulf supplies a complete line of highest quality oils FOR EVERY TYPE OF DIESEL ENGINE

IN the modern Diesel *engine builder's* plant, precision is vital to each mechanical operation. For, the Diesel builder's one aim is to supply the user with an efficient prime mover—an engine that will run continuously over a long period without appreciable wear or repair expense. That is why leading builders safeguard their costly plant equipment with Gulf quality lubricants and assure precision in each operation.

Of great significance also is the fact that 50 leading builders of Diesel engines in the United States have tested Gulf lubricants and placed their stamp of approval on them. Thus, the *operator* knows in advance that *Gulf supplies the right lubricant* for the particular make of Diesel engine installed in his plant.

Gulf Diesel lubricants have been treated and purified by the finest of the new selective solvent processes. They stand up over long periods of service and insure minimum bearing and cylinder wear.

If you are not using Gulf products, we suggest that you discuss the matter of lubrication with a Gulf representative who will recommend exactly the right type of lubricant for your equipment. This safety measure will assure you of lowest maintenance costs for your Diesels.

GULF OIL CORPORATION of Pennsylvania
GULF REFINING COMPANY General Offices, Gulf Bldg. Pittsburgh, Pennsylvania

Makers of that Good Gulf Gasoline and Gulflube Motor Oil

GULF INDUSTRIAL LUBRICATION

Above, a piston is ground for accurate measurement and smooth finish. This grinding wheel takes off only a small cut, and six hours or more are often required to correctly grind one piston.

Classified Directory—*Continued*

Crushers (Jaw and Gyratory)
Allis-Chalmers Mfg. Co.
Austin-Western Road Machy. Co.
Earle C. Bacon, Inc.
Birdsboro Steel Foundry & Mach. Co.
C. G. Buchanan Co., Inc.
Good Roads Machy. Corp.
Jeffrey Mfg. Co.
Lewistown Fdy. & Mach. Co. (Jaw)
Nordberg Mfg. Co.
Pennsylvania Crusher Co.
Pioneer Gravel Equipt. Mfg. Co.
Smith Engineering Works
Traylor Eng. & Mfg. Co.

Crushers (Reduction)
Bonnot Company
Jeffrey Mfg. Co.

Crushers (Roll)
Gruendler Crusher & Pulv. Co.
Pioneer Gravel Equipt. Mfg. Co.

Crushers (Rotary)
J. B. Ehrsam & Sons Mfg. Co.

Crushers (Single Roll)
Austin-Western Road Machy. Co.
Gruendler Crusher & Pulv. Co.
Jeffrey Mfg. Co.
Link-Belt Co.
McLanahan & Stone Corp.
Pennsylvania Crusher Co.

Crushing Rolls
Allis-Chalmers Mfg. Co.
Babcock & Wilcox Co.
Birdsboro Steel Foundry & Mach. Co.
C. G. Buchanan Co., Inc.
Sturtevant Mill Co.
Traylor Eng. & Mfg. Co.

Derricks and Derrick Fittings
Harnischfeger Corp.

Detonators
Atlas Powder Co.
E. I. du Pont de Nemours & Co., Inc.

Diaphragms (Pump)
B. F. Goodrich Co.
Manhattan Rubber Mfg. Div. of Raybestos - Manhattan, Inc.

Dipper Teeth (Manganese)
Taylor-Wharton Iron & Steel Co.

Dippers (Manganese Steel)
American Manganese Steel Co.

Dippers and Teeth (Steam Shovel)
American Manganese Steel Co.
Bucyrus-Erie Co.
The Frog, Switch & Mfg. Co.
Thew Shovel Co.

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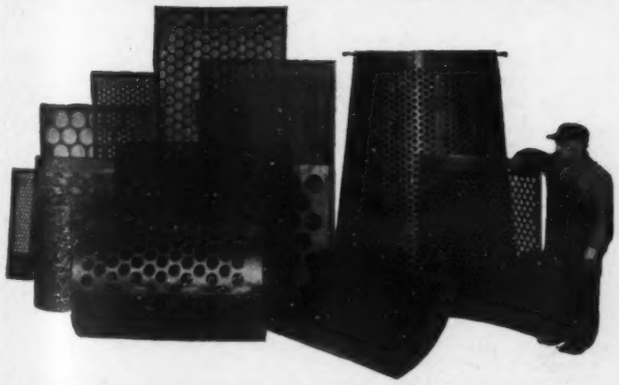

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Manufacturers of: Angledozers, Buggies, Bulldozers, Carryall Scrapers, Cranes, Drag Scrapers, Power Control Units, Rooters, Semi-Trailers.

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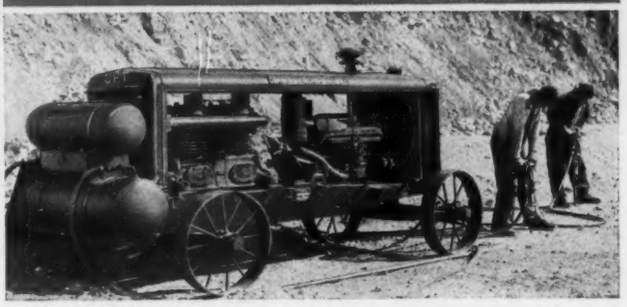
CP PORTABLE COMPRESSORS + CP ROCK DRILLS = PROFITS



THIS CP Two-Stage Air-Cooled Portable Gasoline-Driven Compressor and the CP-42 Sinker Drills are earning profits for a stone quarry.

High compressor efficiency and high drilling speed, dependability and low maintenance cost, backed by a strong service organization, enable CP Compressors and CP Drills to return profits to Contractors, Quarries and others the world over.

Write for Bulletin 758 which describes these outstanding compressors — gasoline and Diesel-driven — and for Bulletin 850 describing CP Sinker Drills.

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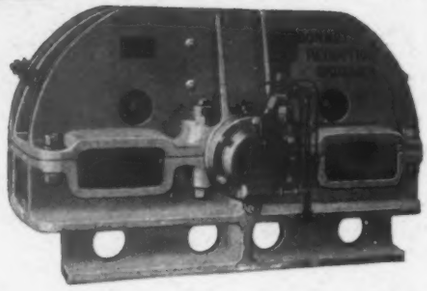
WHY The BONNOT REDUCTION CRUSHER Saves Money

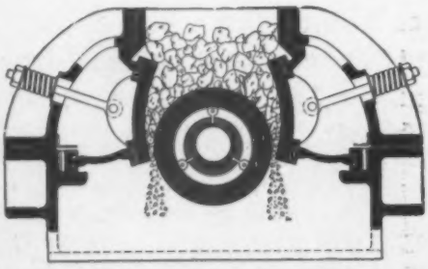


It is the only crusher that has a uniform distribution of wear over the entire crushing area—thus increasing life of wearing parts. Actual tests under full load have conclusively demonstrated the ability of these crushers to produce tremendous tonnage at high speed with low power consumption.

The BONNOT design represents utmost simplicity — unusual ruggedness — minimum choking, etc. Concaves are reversible—Liners are renewable—Safety plates of cast iron and all in all the BONNOT Reduction Crusher is designed and constructed for maximum results at lowest operating cost.

The BONNOT CRUSHER delivers TWO BLOWS INSTEAD OF ONE or 750 BLOWS PER MINUTE.

The BONNOT CRUSHER meets the most exacting demands for crushed aggregates requiring absolute accuracy of sizing plus high strength and bonding value.



Not a roll crusher. Featuring slow creep mantle for distribution of wear.

Manufactured under U. S. Patent No. 1946763

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Write for Bulletin No. 150

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THE BONNOT CO.

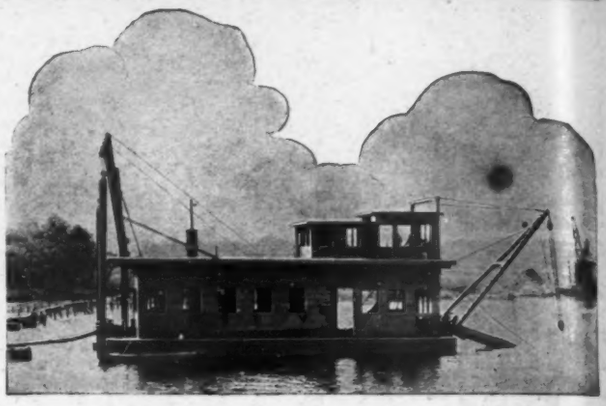
CANTON, OHIO

SINCE 1891

New York Office - - - - 30 Church Street

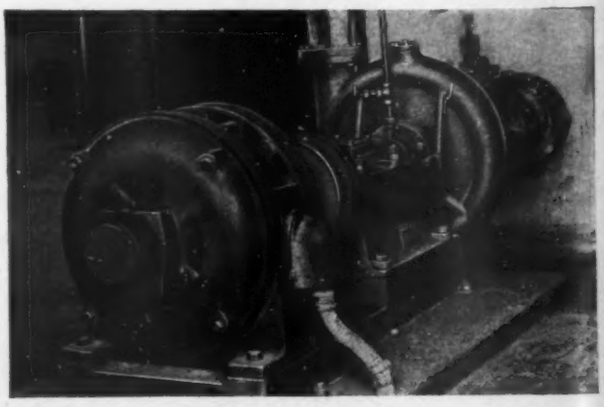
The MORRIS HYDRAULIC COLUMN

News of interest to Centrifugal Pump Users



It Was a Tough Dredging Job, but . . .

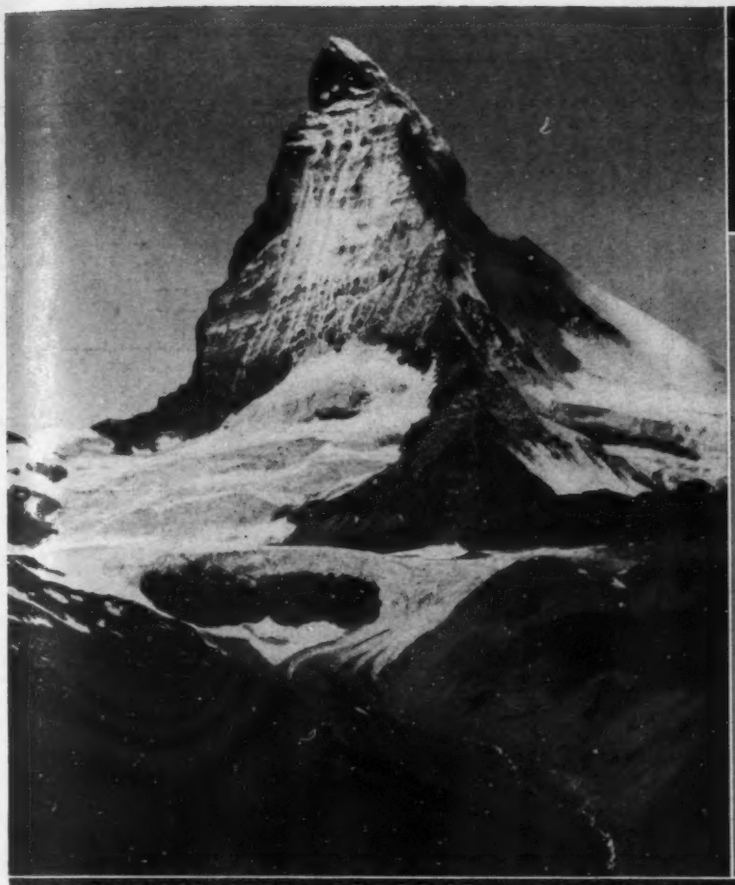
Sand and gravel producers and dredging contractors will be interested in this report of a Morris Dredge owner: "Probably no dredging equipment in Florida has handled more troublesome material, yet our Morris Dredge has repeatedly handled heavy clay at an average cost of 25 cents per cu. yd. This cost includes everything—depreciation, insurance, maintenance, etc. Working with ordinary flowy river sand, this equipment will operate at a cost averaging 15 cents per cu. yd. We commend Morris Dredges to any who seek the best that money and technical brains can develop."



Should an Old Pump Be Repaired or Replaced? . . .

If your 10 or 15-year old pump shows need of repairs, do not order a new part before investigating how much a new Morris Pump will cost and how much it will save. In many instances a new Morris Pump costs little more and may even cost less than repairing an old pump; and in practically every case the improvement in efficiency—usually 10% or more—quickly repays the entire cost of the new pump. You will find the estimates and recommendations of the Morris Engineers conservative as well as authoritative, and their advice is offered without obligation.

For authoritative recommendations on any pumping or dredging problem, write to Morris Machine Works, Baldwinsville, N. Y. Representatives in principal cities.



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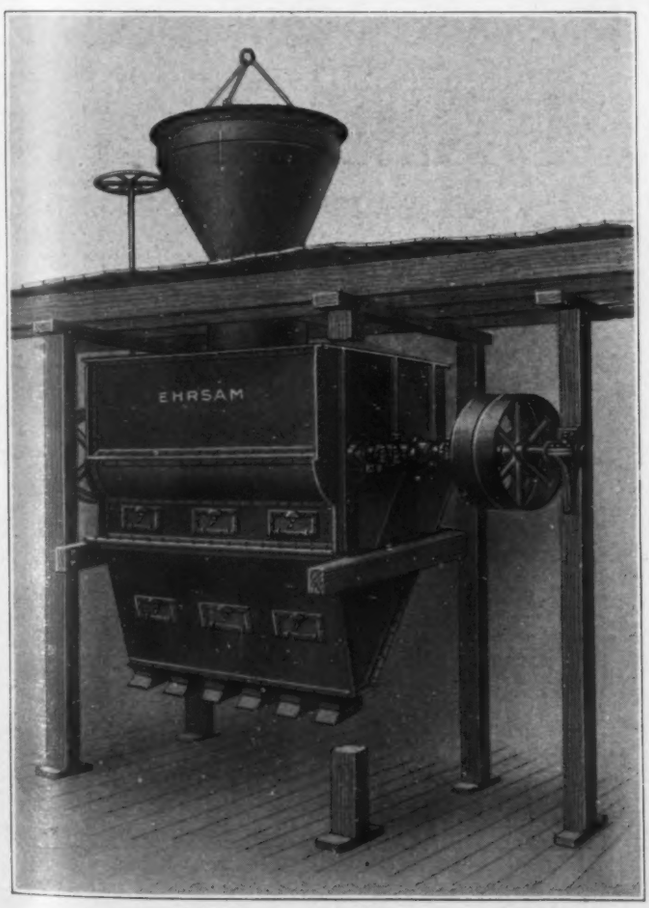

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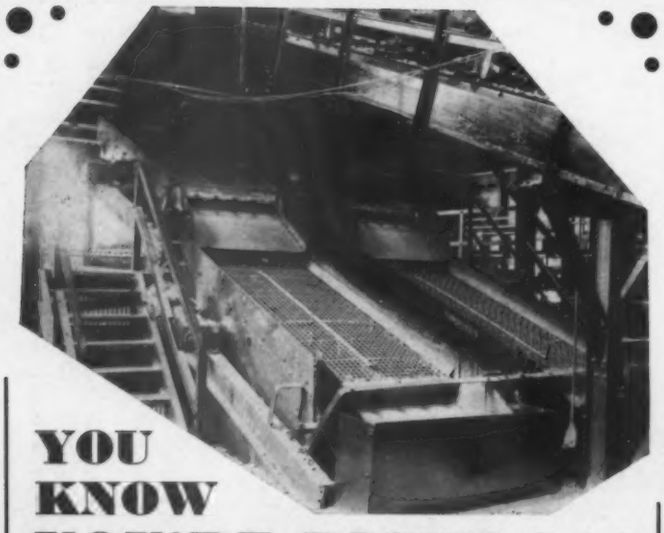

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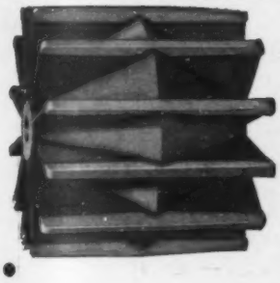

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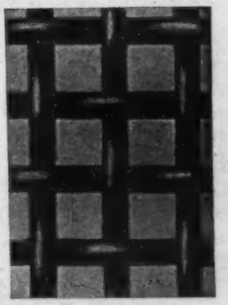

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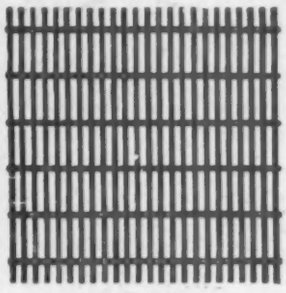

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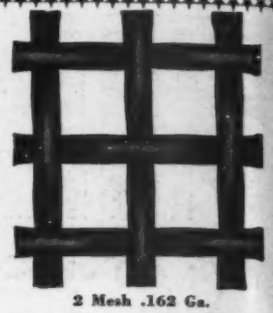

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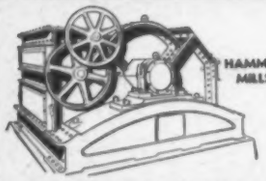

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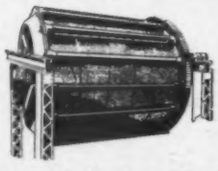

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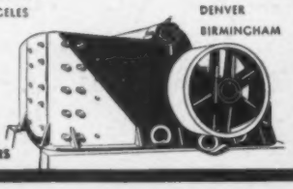

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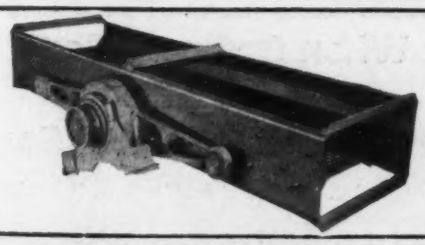

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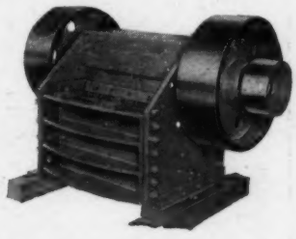

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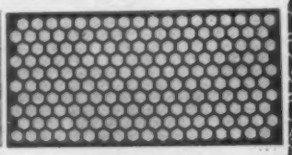
PERFORATED PLATES
for your type of screen
Maximum Wear, Capacity and Accuracy



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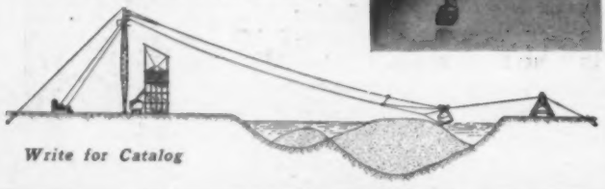

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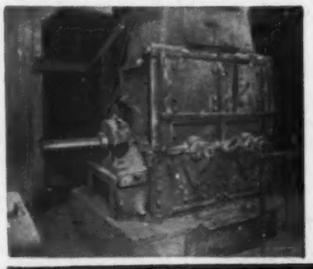
Pulverizers and Crushers
For Large or Small Capacities



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Nearly every plant has something to reduce . . . it makes no difference what it is . . . so when you next think of reduction . . . think of Jeffrey.

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The Jeffrey Manufacturing Co.
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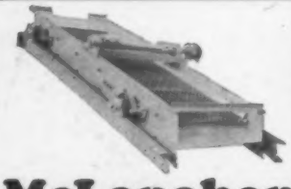

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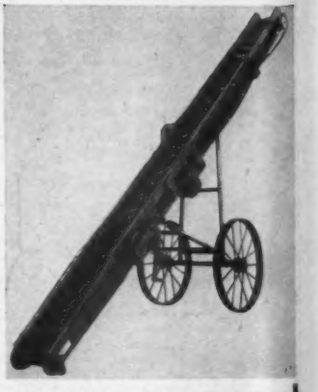

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15 Park Row New York

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In the production of stone, gravel, sand and slag, Symons Cone Crushers and Symons Screens meet the demand for better materials produced at a lower cost.

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Try Dorr-Classified Sand

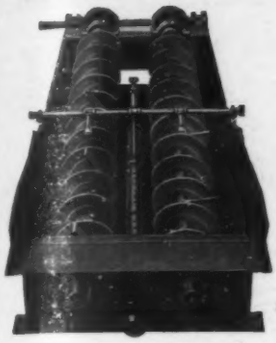
At Grand Coulee and at Boulder Dam, Dorr Classifiers produce high specification concrete sand, having a definite fineness modulus and distribution of sizes.

Write for engineering data on how this "better sand" is made.

THE DORR COMPANY, INC.
ENGINEERS—247 Park Ave., New York
CHICAGO TORONTO LOS ANGELES DENVER

SAND

EAGLE WASHERS



Single and Double

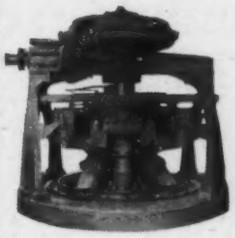
Spiral Screw and Log Type

Guaranteed removal of trash, sticks, leaves, coal, silt, mud-balls,—to the difficult clay-balls and iron oxide conglomerates.

EAGLE IRON WORKS

Des Moines, Iowa

PULVERIZERS



Capacities—1 to 50 Tons per hr.

Finenesses—20 to 350 Mesh.

AIR CLASSIFIERS

Sizes for any desired capacity.

The MODERN **AIR SEPARATOR**

BRADLEY PULVERIZER CO.

ALLENTOWN, PENNA.

CLASSIFIED ADVERTISEMENTS

POSITIONS WANTED — POSITIONS VACANT—two cents a word. Set in six-point type. Minimum $1.00 each insertion, payable in advance.

INFORMATION
Box numbers in care of our office. An advertising inch is measured vertically in one column. Three columns, 30 inches to the page.

CLASSIFIED — Displayed or undisplayed. Rate per column inch, $4.00. Unless on contract basis, advertisements must be paid for in advance of insertion.

Used Equipment for Sale

CONSOLIDATED GOOD USED EQUIPMENT

Selected Special Items

ROTARY KILNS SPECIAL

2—8′x125′ P. & M. Rotary Kilns.

4—8′x110′ Bonnot Rotary Kilns.

3—8′x8′, 6x6, 6x4 Oliver Filters.

12—Rotary Dryers—4′x30′, 5x26, 5x30, 5x50, 8x60, 8′8″x85′.

9—Hardinge Ball Mills—3′x8″, 4½′x16″, 6x22″, iron lined; 8′x72″ unlined. Also other sizes.

1—3′x12′ Hendy Tube Mill, iron lined.

2—5′x10′, 6x12 Rod Mills.

2—Raymond Roller Mills, 3- and 5-roll.

5—Raymond Pulverizers, No. 0000, No. 00, No. 1, No. 3.

3—Gayco Air Separators, 30″, 10′.

3—24″x20″ Jeffrey type "B" Hammer Mills.

2—4′x5′ Tyler Hummer Screens, No. 31, triple deck; 3—4′x7′ double deck; 3′x5′ and 4′x5′ single deck.

18—Jaw Crushers—see listing in May issue.

Just a Partial List

SEND FOR BULLETIN of our regular stock of Crushers; Vibrating Screens; Ball, Rod and Tube Mills; Air Compressors; Rotary Kilns and Dryers; Hardinge Ball and Pebble Mills; Raymond and other Pulverizers; Air Classifiers; Thickeners; Wet Classifiers; Filter Presses; Continuous Filters, etc.

CONSOLIDATED PRODUCTS COMPANY, INC.

15-16-17 Park Row New York, N. Y.

Plant and shops at Newark, N. J., cover 8 acres of ground.

LIQUIDATION SALE

The items shown below are a few of those included in the equipment and machinery of a large modern stone crushing plant being liquidated. These and all other items are available at liquidation prices:

1—5½ foot Symons Cone Crusher—Shop No. 520—9″ Shaft—Bronze Bearings.

2—Type 10 I. R. Air Compressors. Air Cylinders, 19 x 16 and 12 x 16—16 x 14 and 10 x 14.

1—Type 37 Marion Steam Shovel—Serial No. 5295. Mounted on crawling tractor trucks.

3—36″ Gauge Gasoline Locomotives:
1—Plymouth—Shop No. 1562.
1—Vulcan—Shop No. 3608
1—Whitcomb—Shop No. 13063.

1—I. R. Drill Sharpener No. 50, with dies, dollies, gauges and formers.

18—Western and Continental 4 and 5 Yard Double Side Dump Cars.

For complete inventory and quotations address

F. G. HAMBLEN, AGENT
P. O. Box 572, Greenville, S. C.

LOCOMOTIVES

3—50-ton American 4-wheel saddle tanks, 16x24″ cylinders, Code boilers, one built 1927.

4—40-ton American 4-wheel saddle tanks 14x22″ cylinders, Code boilers, one built 1924.

5—40-ton Baldwin 4-wheel saddle tanks, 14x22″ cylinders, Code boilers, built 1924.

LOCOMOTIVE CRANES

1—30-ton American 8-wheel, built 1925.

1—25-ton American, 8-wheel, built 1923.

1—20-ton Industrial, 8-wheel, built 1924.

All have Code boilers.

DUMP CARS

20—30-yard Western all-steel air lift door 2-way side dumps.

Complete stock list on request.

BIRMINGHAM RAIL & LOCOMOTIVE COMPANY

BIRMINGHAM, ALABAMA

SHOVEL FOR SALE

Marion 1¼-yd. Steam Shovel.

Sauerman 1-yd. Drag Scraper Outfit.

Blaw-Knox Batcher with scales.

P&H ½-yd. Gas Shovel.

All late models, in good condition, low for cash. Used only in our own pit, also complete Sand and Gravel Washing Plant, cost $125,000, capacity 600 to 800 tons daily.

Maine Sand & Gravel, Inc.
443 Congress Street
Portland, Maine

Haiss-Fordson Digging Loader on Wheels.
Buda 35 HP. 4-cyl. Engine with Pulley.
Centrifugal Electric Pump, 8″ inlet, 6″ outlet.
Kennedy Van Saun Gyratory Crusher No. 37.
Chain Elevators with 10″ and 12″ buckets.
Hummer 2-deck 3x5′ Vibrating Screen.
Tyler 4 KW 15-cycle Generator, V-drive.
Jeffrey No. 3 Jaw Crusher with Hammer Mill.
Swivel ¾-yd. Dump Cars, 24″ gauge.
Portable Track, Switches, Cars, Locomotives.
Hoists, Air Compressors, Rock Drills, Skips.
Trippers for 18″ and 24″ Belt Conveyors.
700 Selected Belt Idlers, 18″ to 36″.
Conveyor Belt 30″ and 36″ wide.
Robins 24″x115′ Conveyor with Belt.
Robins 24″ Skeleton Trough Conveyors.
Robins 18″ Skeleton Trough Conveyors.
Hayward 1-yd. Clamshell Bucket.
Owen ¾-yd. Clamshell Bucket.
Star Welder, 4-cyl. LeRoi, 220 Amperes.

G. A. Unverzagt, 15 Park Row, New York City

RAILS AND CARS

All weights, new and used rails, 12 lbs. to 100 lbs. Portable track, drier cars, all gauges—"V" shape and Western Cars. In centrally located warehouses. Wire or write for prices.

M. K. FRANK

480 Lexington Ave. New York City — P. O. Box 1234, Pittsburgh, Pa.

ELECTRICAL MACHINERY

Motors and Generators, A.C. and D.C., for sale at attractive prices. New and Rebuilt. All fully guaranteed. Write for List and Prices.

V. M. NUSSBAUM & CO.,
Fort Wayne, Indiana

CARS

12-Yd. Western Air, also Hand Dump Cars, Flats, Gondolas, Steel Hopper Cars, Box Cars, Locomotives.

HYMAN-MICHAELS COMPANY

20 N. Wacker Dr. Bldg., Chicago, Ill.
Railway Exch. Bldg. St. Louis, Mo. — 101 West 31st St. New York

(Classified Advertising Continued on Next Page)

Continued from Preceding Page

USED EQUIPMENT

FOR SALE

LOCOMOTIVE, 1 5-ton Vulcan, Loco. No. 3872, Engine No. 43793, 36" gauge. Used one season.

SIDE DUMP CARS, 16, 36" gauge, all steel 1½-yd.

All equipment in good condition.

Address Box 716, care of Rock Products, 330 South Wells Street, Chicago, Ill.

60, 80, 180 and 360 HP. Diesel Engines.
4—750 HP. Busch Sulzer Diesel Units.
15-ton 70-ft. Boom Stiff Leg Derrick.
17-ton Link Belt K-42, 55-ft. Boom Crane.
Bonnot 4x22 Tube Mill & Traylor 6x8.
750-yd., 1250-yd. and 2000-yd. Asphalt Plants.
2—1¼-yd. Thew Steam Shovels.
2—2-yd. cap. Bucyrus Diesel Draglines.
½-yd. Speeder Caterpillar Crane.
Champion 1030 & 1040 Roller Bear. Jaw Crushers.
Pennsylvania SX4 SX6 and SXT12 Hammermills.
368 ft. Chgo. Pneu. Elec. Air Compressor.
150-ton 50-ft. R.R. Track Scale.
3—870-ft. XCB Air Compressors.
Superior 10-in. and 36-in. McCully Crushers.
Traylor 4—10TZ Reduction Crusher.
2—14-ton Plymouth Gasoline Locomotives.
3—3-yd. Koppel V-Shape, 36-Ga. Dump Cars.
Jaw Crushers: 60x84, 42x36, 42x40 and 36x24.

R. C. STANHOPE, INC.
875 Sixth Avenue — New York, N. Y.

FOR SALE

One 638 cu. ft., two-stage, short belt driven air compressor.

One Thomas two-speed, two-drum, 55-hp. electric hoist.

P. A. HENAULT
2140 Book Bldg. — Detroit, Michigan

FOR SALE

Stone Crushing Plant and Equip.

Now producing crushed stone, limestone, and pebbledash. Perfect condition. Must be removed 30 days.

Fred Hurst, Hurstville, Ia.

FOR SALE

Large Sandstone Quarry—"Roaring Run"—Curwensville, Clearfield County, Penna. White and shaded sandstone. Gang-saws, compressors, derricks and engines, tools, buildings, railroad siding. For terms apply,

H. W. Comfort Estate, 1 West State Street, Trenton, New Jersey.

GEORGE HAISS MFG. CO., Inc. — **HAISS** — **Park Ave. and 143rd St. New York**

Send me full details and prices on equipment checked

FACTORY REBUILT CLAM SHELL BUCKETS

- ☐ 1—Haiss ½-yd. HiPower Digging Bucket.
- ☐ 1—Owen 2½-yd. Type "S" Bucket.
- ☐ 1—Owen ¾-yd. Type "D" Bucket.
- ☐ 1—Haiss 1-yd. Contractor Type Bucket.
- ☐ 1—Blaw Knox ½-yd. Lever Arm Bucket w. teeth.
- ☐ 1—Hayward ½-yd. Type "E" Bucket.

FACTORY REBUILT TRUC LOADERS, BELT CONVEYOR, ETC.

- ☐ 1—Haiss 2-yd. a min. Creeper Truck Loader.
- ☐ 1—Haiss 1¼-yd. a min. Creeper Truck Loader.
- ☐ 1—Haiss 25' 16" Trough Conveyor, Gas-Elec.
- ☐ 1—Snow Plow Model 10A Champion 8' wide, new $80.

Name .....
Address .....

USED EQUIPMENT

Jaw Crushers—2"x6" up to 66"x84".
Crushing Rolls—12"x12" up to 54"x24"—Gyratory Crushers—No. 3 up to 42".
Ring Roll Mills — No. 0 and No. 1 — Swing Hammer Mills.
Rotary Fine Crushers—No. 1, No. 1½, No. 2.
Direct Heat Rotary Dryers—4'x30', 5'x30', 5½'x40', 6'x50', and 3½'x25'.
Semi-indirect Heat Dryers, 4'x30', 4½'x26', 5'x30' and 8½'x75'.
Cement Kilns—3' up to 9½' diameter.
Hardinge—Marcy & Fuller—Lehigh Mills.
Raymond Mills—No. 00, No. 0, No. 1 & No. 3 roll.
Tube—Rod and Ball Mills—4' to 8' diameter.
New dryers made for all purposes.
2—8'x72" Hardinge Mills—90% new.
Air Compressors—One No. 27 I-R oil furnace for drills—Cranes—Shovels.

W. P. HEINEKEN
95 Liberty St., N. Y. — Tel.: Barclay 7-7298.

FOR SALE

12—5-yd. 36" ga. Western Dump Cars.
6—2-yd. 36" ga. Koppel Steel V Dump Cars.
4—1½-yd. 36" ga. Insley Steel V Dump Cars.
2—3½-ton 36" ga. Whitcomb Gasoline Locomotives.
1—9x10 Sturtevant Vertical Steam Engine.
1—10x10x12 Ingersoll Steam-Driven Air Compressor.
1—9x10 Lidgerwood 3-Drum Steam Hoist.
1—8¼x8 Lidgerwood S.D. Steam Hoist.
22—12-yd. Western std. ga. Air or Hand Dump Cars.
2—40-ton Baldwin S.T. Locomotives, 14x22 cyls.
Rails—First-Class Relay Rails and Bars, 60, 70, 80, 85, 90 and 100 lb. Rails, Tie Plates, etc.

HYMAN-MICHAELS CO.
20 N. Wacker Dr. Bldg., Chicago
Railway Exchange Bldg. — St. Louis, Mo.
101 West 31st St. — New York

We are liquidating the largest surplus stock **best quality NEW WIRE ROPE.** All sizes ⅝" to 2"—Black and Galvanized—All Grades and Constructions. Write, wire, phone for our drastically reduced prices.

DULIEN STEEL PRODUCTS, INC.
Woolworth Bldg., 233 B'way, New York; Phone: Cortlandt 7-4676
534 1st Ave. So., Seattle, Wash. Phone: Main 0030-31

Hummer Heavy-Duty Vibrating Screens

4 Single Units 4'x5'—2-Deck with V-16 Vibrators.
2 Double Units 4'x5'—2-Deck with 2 V-32 Vibrators.
1 Tandem Unit 4'x5'—1-Deck with 2 V-32 Vibrators.
1 Double Unit 4'x6'—1-Deck with 4 V-32 Vibrators.
2 Tyler 7½-hp. A.C. Motor Generator Sets.
G. A. Unverzagt, 15 Park Row, New York City

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25 All steel Koppel Fig. 2956 Quarry Cars, 2-yd. 24" ga. Very heavy construction.
2000 ft. I-R Direct motor drive compressor.
150 H.P. Worthington Diesel Engine.
20-ton Brownhoist Locomotive Crane. Overhauled, $2,500. ASME Boiler.
60-HP. 3 drum & Swing. American Gas Hoist, $1,250. Waukesha Engine.

MISSISSIPPI VALLEY EQUIPMENT CO.
515 Locust St. — St. Louis, Mo.
Headquarters for Quarry and Power Equipment

SHOVELS • LOCOMOTIVES

2—120-B Bucyrus-Erie Electric Shovels.
1—1-yard Osgood Steam Shovel.
1—50-ton Heisler Geared Locomotive.
1—42-ton Heisler Geared Locomotive.
2—50-ton Vulcan Duplex Locomotives.
ALL IN UNUSUALLY GOOD CONDITION
Located Eastern Pennsylvania

Frank Swabb Equipment Co., Hazleton, Pa.

½-yd. Gas Crawler, Crane & Dragline, $650
¾-yd. Gas Crawler Crane, 50' boom... 900
3x6 Vibrating Screen, rebuilt..... 150
18"x100' ball-bearing Belt Conveyor.. 350
New and Used Gasoline Power Units, from 25 to 200 h.p. capacity. Many other items at equally attractive prices.

Triangle Engrg. Co., 53 W. Jackson, Chicago

USED EQUIPMENT

1—1000 ft. C. P. 2-stage elec. compressor complete with sync. motor, receiver, etc.
1—Link-Belt 70 ft. bucket elevator, cap. 150 T. P. Hr.
2—72-ton Blaw-Knox Bins.
1—Truck charging hopper with grate.
1—Link-Belt 24 x 25 ft. belt conveyor, capacity 150 T. P. Hr.
1—2-yd. Jaeger Truck Mixer.
1—3-yd. Clamshell Bucket.
2—1-yd. Ransome right and left hand concrete mixers.

Write for Latest Stock List

RENTAL SERVICE CO., INC.
20th & Venango Sts. — Philadelphia, Pa.

GOOD USED EQUIPMENT

Monighan 6160, 3W, 2W, & Bucyrus Diesel Drags.
Northwest ¾ & 1 yd. Cranes & Drags. Bargains.
Shovel Fronts—L-B K-55 & 2, P&H 206, NW, etc.
Sauerman 1 yd. Drag Scraper outfit. Belted type.
1—Same, except extended bed. Power optional.
Williams Hammermills; No. 4 Jumbo, Nos. 3 & 0.
Tractor Hoist, 2 drum, new. 2—Truck winches.
B-G & Haiss Loaders. Cement Block Plant.
Hoists & Derricks; Clam. & Drag. Buckets, etc.
James Wood, 53 West Jackson, Chicago, Ill.

USED EQUIPMENT WANTED

Wanted

Used Air Compressor, 5,000 CFM or the equivalent, with synchronous motor, 2,300-volt—3-phase—60-cycle. State price and full particulars. Address Box 739, care of

ROCK PRODUCTS
330 S. Wells St. — Chicago, Ill.

WANTED—Several Raymond or Williams roller mills of various sizes to be rebuilt for export. Condition immaterial, but must be cheap for cash. Describe fully. Address

Box 696 care of Rock Products
330 South Wells St. — Chicago, Ill.

CRUSHER WANTED

Would like to purchase—in good order and condition — second-hand McCully ten-inch fine reduction crusher without belt pulley.

CALAVERAS CEMENT CO.
315 Montgomery St. — San Francisco, Cal.

THESE columns offer you the best medium in the rock products industry for the sale, exchange and purchase of used equipment, rock, quarry and gravel-pit property; the circulation and buying influence of Rock Products extends beyond those now actually engaged in operating plants; it includes mining engineers and capitalists who may be reached through no other medium, because of Rock Products' world-wide reputation as the *business journal* of the rock products industry.

"E. C. A. REBUILT" QUARRY and GRAVEL PLANT EQUIPMENT

AIR COMPRESSORS

Portable and stationary, belt, with elec. or gas. power, sizes from 21 cu. ft. to 1,000 cu. ft.

BUCKETS

246—Buckets, all sizes and makes.

CARS

Large lot including std. ga. 6- and 12-yd. and 20-yd., 36-ga. 5-yd., and 24-ga. 1½-yd. Also std. ga. flat cars and ballast cars.

CONVEYORS and ELEVATORS

9—Port. belt conveyors with steel frame, gas. or elec. pr. 18 and 24 in. Barber-Greene and Chic. Automatic.
11—Bucket elevators: 6 Chain Belt Co., Weller and Link-Belt vertical enclosed type; capacities from 35 to 117 tons per hour. 5—Weller inclined type. Nos. 3, 4, 5 and 6 up to 170 yds. per hr.

CRANES (Locomotive)

5—Locomotive cranes; sta. ga., 30 and 25 tons; Ohio, Browning, American, Industrial.

CRANES and DRAGLINES

1—Northwest Type M, Serial 2334, 60-ft. boom, 1¼-yd. bucket.
1—Industrial Brownhoist Model DC Diesel crane, Serial 5176, 60-ft. boom, 1¼-yd. bucket.
1—Northwest Model 104, Ser. 2079, 45-ft. boom, 1¼-yd. dragline or clamshell.
2—Osgood No. 2054, 2069, with 40-ft. boom, 1 with 1-yd. shovel front.
1—Brownhoist No. 2, Ser. 9964, 40-ft. boom, 1-yd. bucket.
1—Link Belt K-1, Ser. 1024, 50-ft. boom, 1-yd. bucket.
1—Industrial Brownhoist type CC, Ser. 5071, 36-ft. boom, ½-yd. bucket.

CRUSHERS

1—Symons coarse cone crusher, size No. 5½, SU No. 521.
1—Set P & M crushing rolls, size 42x16".
1—Allis-Chalmers Gates No. 6.
1—Austin No. 6, Serial 2836.
1—Austin No. 5, Serial 1960.
2—McCulley No. 3 gyratory.

DERRICKS

Steel and wood, stiff leg, or guy; from 2 to 50 tons, including 2 steel stiff legs.

DRILLS and DRILL SHARPENERS

3—Gardner Denver wagon or derrick drills with Model 21 or 17 Gardner drills for channelling.
25—Ingersoll-Rand and Sullivan jackhammer, column, and tripod drills.

HOISTS
(Electric and Gas)

55—Electric, ranging from 20 HP. up to 125 HP., consisting of triple-drum, double-drum and single-drum with A.C. or D.C. mtrs., some with attached swingers.
38—Gas hoists, ranging from 8 to 120 HP., single, double and triple-drums; all standard makes.

LOCOMOTIVES

32—Gasoline locomotives from 14-ton to 2-ton standard 36 and 24-ga.
3—Steam saddle tank locomotives; 1—24-ton Porter, cyl. 12x16"; standard ga., Ser. No. 5093; 1—19-ton Davenport, cyl. 10x16 std. ga. Ser. No. 2036; 1—20-ton Porter, cyl. 11x16, 36-ga. Ser. No. 6753.

PUMPS

All sizes and types, both force, centrifugal and steam.

SHOVELS

1—Industrial Brownhoist Type DC No. 5176 Buda Diesel eng., 1¼-yd. cap.
3—Link-Belt shovel attachments for K-55, K-44, K-42, K-38 or K-2.

EQUIPMENT CORPORATION of AMERICA
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P. O. Box 5419, Kingsessing Sta.
Phone Granite 7600

Chicago
1119 S. Washtenaw Ave.
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Pittsburgh
P. O. Box 933
Phone Federal 2000

BUSINESS OPPORTUNITIES

Representatives wanted to sell on commission basis a high grade wire cloth used extensively in sand, gravel, stone, coke plants, cement mills, etc. Address Box 707, care of Rock Products, 330 S. Wells Street, Chicago, Ill.

COMPLETE GRAVEL PLANT

FOR SALE—On Lower Mississippi River, with 15" steel dredge, diesel-electric, all equipment steel. Operating now with considerable unfilled orders at good prices. Good reason for selling. Address **Box 733, care of Rock Products, 330 South Wells St., Chicago, Ill.**

POSITIONS VACANT

SHOOTER WANTED

Must be capable of supervising all kinds of Open Quarry Blasting.
Only experienced and those with good references need apply.

WHITEROCK QUARRIES
Bellefonte, Pa.

Those seeking positions may, possibly, find them by making their wants known to a large number of employers who read the advertisements in this section.

POSITIONS WANTED

SUPERINTENDENT

—desires a permanent connection with a progressive crushed stone company. 20 years' practical experience in operating trap rock or limestone quarries and crushing plants. Familiar with all modern equipment, capable of taking full charge of any proposition. Prefers connection where eventually he could purchase a substantial interest. Unquestionable references. Open for engagement. Address Box 777, care of Rock Products, 330 S. Wells St., Chicago, Ill.

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Seasoned Sales Executive—maintaining Philadelphia office for past fifteen years selling CHEMICAL LIME—knows consuming trade from Ohio to Maine—is open for a worth-while proposition from a reliable concern.

Company he now represents will furnish finest references.

Address Box 740, care of Rock Products, 330 South Wells Street, Chicago, Ill.

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H. J. BROWN
CONSULTING ENGINEER
35 Doane Street, Boston, Massachusetts
Specializing in Gypsum Plants and in the Mining, Quarrying and Manufacture of Gypsum Products.

Consultation	**Design**
Examinations	**Construction**
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WE LOOK INTO THE EARTH
By using Diamond Core Drills. We drill for Limestone, Gypsum, Talc, Fire Clay, Coal and all other minerals.
PENNSYLVANIA DRILLING CO.
Drilling Contractors
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Consulting Engineer
Dealer in PHOSPHATE LANDS and all grades of rock.
10-mesh PHOSPHATE FILLER, $3.00 net ton
40 years' experience TENNESSEE PHOSPHATE FIELD. Correspondence solicited. Can find what you want if it can be found.
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ALL DOWN THE LINE—

Every last man in your plant can profit by reading ROCK PRODUCTS regularly. It will help him to bring new interest and new efficiency to his job.

Rock Products
Successor to CEMENT and ENGINEERING NEWS Founded 1908
330 S. Wells St., Chicago, U.S.A.

See to it that ROCK PRODUCTS reaches you regularly—and pass it around! Subscriptions for the keymen would be mighty good investments.

We produce:

☐ Crushed Stone	☐ Gypsum
☐ Sand & Gravel	☐ Phosphate
☐ Glass Sand	☐ Cement
☐ Lime	☐ Slate
☐ Sand-Lime Brick	☐ Talc

Other Materials.....
We retail.....

Date....., 1936

Please enter my subscription to ROCK PRODUCTS for.....year..... (three years $5.00, one year $2.00—please state which. You save a dollar by subscribing for three years), for which we enclose $.....

Name.....
Street.....
City.....State.....

Canada $2.00. Foreign Subscriptions $4.00 a year

BIG PROFIT COMBINATION

YOUR SAND—THIS MACHINE

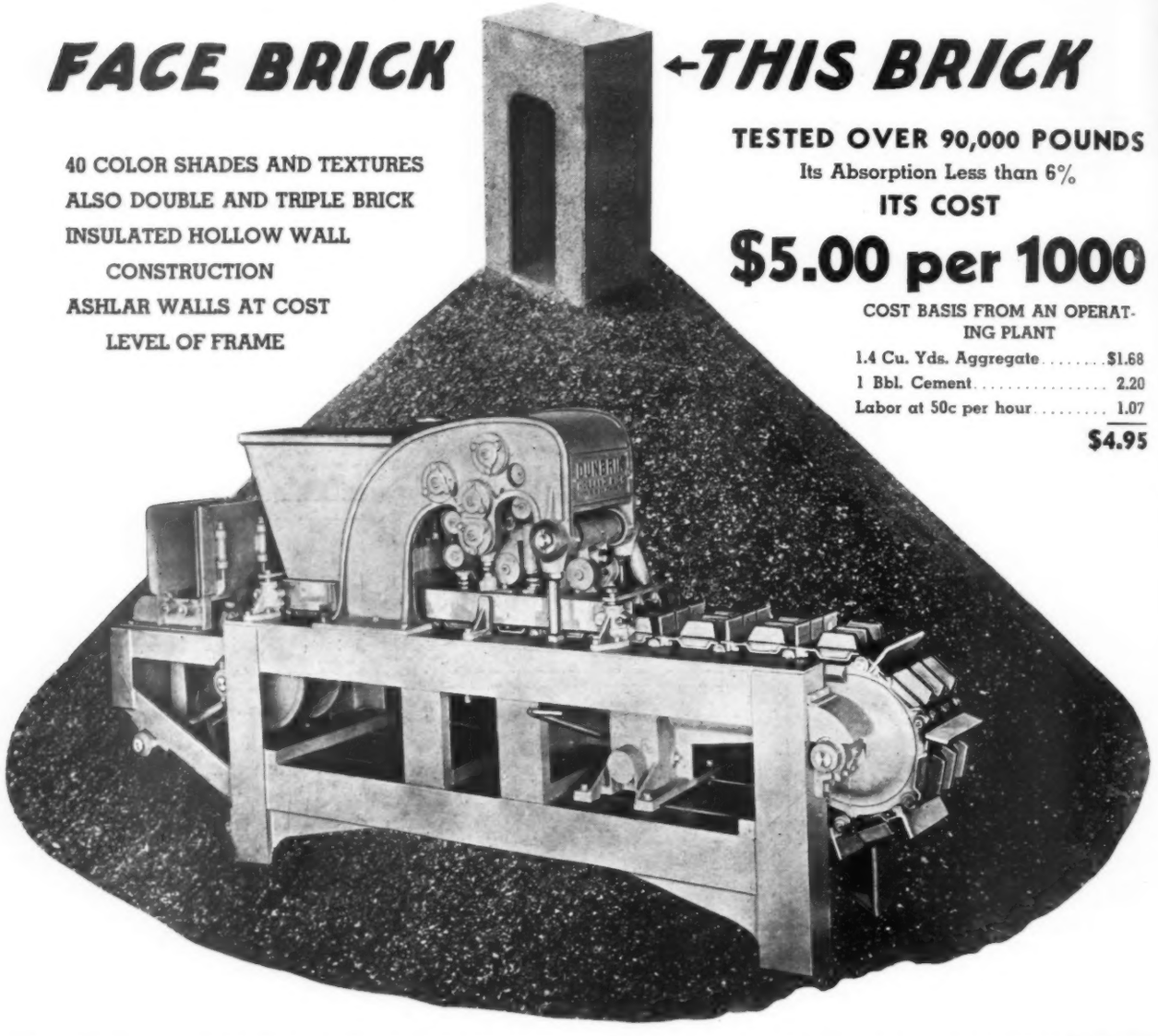
FACE BRICK ←THIS BRICK

40 COLOR SHADES AND TEXTURES
ALSO DOUBLE AND TRIPLE BRICK
INSULATED HOLLOW WALL
CONSTRUCTION
ASHLAR WALLS AT COST
LEVEL OF FRAME

TESTED OVER 90,000 POUNDS
Its Absorption Less than 6%
ITS COST
$5.00 per 1000

COST BASIS FROM AN OPERATING PLANT

1.4 Cu. Yds. Aggregate	$1.68
1 Bbl. Cement	2.20
Labor at 50c per hour	1.07
	$4.95



GETTING READY TO MAKE MONEY

Men of foresight in the aggregate industry are now preparing to cash in on the rapidly increasing demand for permanent building material. Consolidated Rock Products Co., Brooksville, Fla.—F. A. Rider Sand & Gravel Co., Vestal, N. Y.—Riverside Sand & Gravel Co., Thiensville, Wis.—Alabama Ice & Utilities Co., Montgomery, Ala.—Consolidated Quarries of Georgia—Georgia Mineral Products Co., Tate, Ga.—Bayer-Brice Co., Flint, Mich.—are some of the producers that are set to profitably convert their surplus aggregate into DUNBRIK and DUNSTONE—a superior trademarked building material.

Today's building market demands permanent, colorful construction at a lower cost. With your aggregate and the automatic DUNBRIK machine, you can produce a superior brick and DUNSTONE in both common and faced that permit hollow wall and ashlar types of construction at cost level of frame.

Here is the outstanding business opportunity for you in your locality. Why not investigate now. It will cost you nothing and may mean many thousands of dollars to you. Send for "4 Keys to Manufacturing Success." Write today. It tells the complete story.

23 W. 24th St. **W. E. DUNN MFG. CO.** Holland, Mich.